TEACHING THE INDUSTRIAL ARTS

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By EMANUEL E. ERICSON

Professor of Industrial Arts, University of California, Santa Barbara College; and Assistant Director, University Extension, University of California.

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To MAURINE

PREFACE TO SECOND EDITION

This revised edition of TEACHING THE INDUSTRIAL ARTS has been rewritten extensively in recognition of changes and developments which have taken place since the original volume was presented. Considerable material has been replaced in Chapters II, IV, V, and XI. Chapters VII, VIII, XII, XIII, and XIV have been completely rewritten, with some changes in titles to indicate more clearly the interpretations and implications which have been emphasized.

In these revisions, the original emphasis upon directness of approach and application to actual teaching situations in the daily routine of the teacher, which has been a recognized feature of this book, has been maintained.

The author is indebted to a number of associates for assistance in making the revisions: to Dr. Kermit A. Seefeld and Dr. Ralph K. Nair for reading the manuscript; to Dr. Robert A. McCoy and Dr. Paul L. Scherer for help with photography and other illustrations; and to the large number of professional colleagues in many teacher-education institutions who have given generous responses to inquiries concerning desirable revisions based upon their use of the book. Recognition is also gladly given to students for contributions and stimulation, particularly in graduate courses and seminars, in the various colleges and universities where the author has had the privilege to serve as a summer session faculty member.

It is hoped that the book will continue to serve with renewed timeliness the constantly growing group of teachers in preparation as well as those already in the teaching profession among whom the book has found generous acceptance in the past.

PREFACE

The activities of industrial arts teachers may be divided into two general classifications. The first of these consists of analysis and planning; the second covers presentation of teaching material. The chief concern of this book is to encourage teachers in service, and those who are in preparation for teaching, to recognize and analyze the many problems and opportunities that confront them as teachers, and to offer suggestions that will lead to a more effective and satisfying teaching career.

To this end this book is purposely practical in viewpoint, and deals with teaching situations and personal relationships rather than with backgrounds and psychological principles. Patterns of organization, class management, teaching methods, and lesson planning, while presented in detail, are not considered to be final, but serve as examples of definite planning and organized procedure.

The general organization of the content from Chapter I to Chapter X may be thought of as coördinated with the teaching activities of the complete school year, from the time of appointment to the final reports, while the remaining chapters deal with many of the added responsibilities of the teacher outside of his classroom.

Portions of material used in this book have previously appeared in different forms in *Industrial Education Magazine*, *Education*, *Sierra Educational News*, *Industrial Arts and Vocational Education*, and in the book *Teaching Problems in Industrial Arts*. Photographs and other illustrations used are acknowledged in captions.

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Chapter I

STARTING THE SCHOOL YEAR

The Basis for Teaching Success

The content of this book is organized upon the concept that preparedness is the keynote to successful teaching. The stressing of this concept does not, however, necessitate discounting native aptitude as a factor in teaching success. It simply means that whether a teacher has much talent or little talent, much experience or little experience, his ultimate effectiveness in the classroom will depend largely upon the detailed preparation which he makes for his teaching. And at no time is the need for careful preparation more pressing than in the annual process of planning for a new school year.

In the field of industrial arts the need for planning becomes more acute than in most other subjects because of the many differences in conditions under which shopwork is taught. And it is for the purpose of assisting both prospective and experienced industrial arts teachers in planning ahead and solving the many "teaching problems" that confront them that this book has been written.

Each Year a New Challenge

The very nature of a teacher's activities makes him conscious of working by the year. One school year ends and another begins. Whether he comes in as a new teacher or stays where he is under the security of permanent tenure, it is still true that with September comes a new year, new students, and, in many cases, new subjects to teach. In this condition lies an advantage in that there is a challenge to renewed effort, better planning, and a new chance for thinking ahead.

Each year there is a large group of teachers who are going into new positions. This group may be divided into three classes: (1) those who have just finished their teacher training and have signed enthusiastically their first teaching contracts, (2) those who have previously taught, but for some reason did not stay in their place of service, and (3) those who, while they continue to serve the same school system, have been transferred to different buildings, or have been appointed to teach different subjects. The following suggestions for activities preliminary to the beginning of school are offered for all these classes of teachers in so far as they apply:

When to Arrive

When a contract is signed, or other appointment is made, a date for official arrival of the teacher is usually specified. This date may be that upon which school convenes in some cases, but is more often one set for teachers' meetings, and sometimes for institute meetings, preliminary to the beginning of the school year. More and more it is becoming customary to call for the arrival of all teachers, and particularly those working in shop subjects, a number of days before school convenes.

With the conscientious teacher, the question is not, however, so much, "When am I compelled to arrive according to my contract?" as, "When should I arrive in order to do the necessary preliminary work?" The answer to the second question cannot be uniform for all conditions. Because of differences in types of work, differences in condition and extent of equipment, status of courses of study, and the like, each teacher will of necessity have to determine for himself just how much time is needed for preliminary preparations.

Marking Time or Going to Work

Arriving on the job ahead of the prescribed time is of little

value, however, unless the teacher develops a definite plan for his activities after arriving. Many teachers have responded to the urge to "be on the ground" early, but, having arrived there, have found little or nothing to do. The reason for this has been not that there were no problems to be solved, but rather that the teacher had no organized method of locating and solving such problems as existed and as do exist in every school shop.

In this connection there is a clear necessity for job analysis on the part of the teacher. If he will but concentrate his thinking upon the details of his activities for the first week or two after instruction begins, he will be greatly aided in making the analysis of jobs to be performed and problems to be solved as a matter of preparedness for the first roll call.

As a further aid in this regard it is recommended that the instructor make out a written schedule or analysis of the possible duties that may be performed, and of the opportunities for establishing himself, before the actual teaching process is under way. The following paragraphs are intended to offer suggestions covering the scope of such activities and opportunities, with further suggestions bearing upon possible procedures and solutions.

Getting Acquainted

The first demand upon the time of a new teacher can well be for the purpose of becoming acquainted with people with whom he will work and live and with general conditions that will affect his duties and opportunities. While problems of shop organization may be pressing, it would be a short-sighted practice for the teacher to use all of his working time in the solution of those problems, and thus fail to lay foundations for his acceptance in the system as a general faculty member and in the community as a new citizen and neighbor.

Many new teachers overlook the fact that persons who are

met as strangers today are expected to be one's friends and co-workers tomorrow. The first impressions left with such persons will be strong ones, and will determine in many cases later opportunities for happiness and success. Thoughtless words and actions in early dealings with future colleagues, the office force, future students, and parents have a way of causing embarrassment at later times. The same suggestion holds regarding contacts with people outside of the school. It is well to remember that the merchant in the store, the real-estate man from whom one rents a house, or the clerk in the water office might be a person whom one will meet again in a social connection, or be one who is intimately connected with school affairs in some way or another. These suggestions are given not so much with the thought that a teacher would make it a habit to insult people with whom he transacts business, but rather to emphasize the desirability to be conscious of the value of a friendly attitude, and the need for a definite program for making friends not only during the early days of arrival but at all times.

Meeting the Administrator

It is obvious that the new teacher should report to the school administrator as one of the very first activities after arriving on the job. It is unwise to attempt to learn about conditions in a roundabout way before reporting officially to the proper administrator. This is true even though the new instructor arrives much earlier than requested. If it becomes known at a later time that the teacher has approached school-board members, other business men, teachers, custodians, and others for information that should be of an official nature, a suspicion might well be developed regarding the ethics of the teacher or his judgment, or both.

When deciding who is the appropriate administrator to approach, the teacher will need to use the best of judgment.

Previous visits, correspondence, and official instructions will help to clear this point. In general, the advice would be not to "go over the head" of the person who is in immediate line of responsibility. If a department head or supervisor has been instrumental in working out the original appointment to the position, that person should be recognized, and be counted upon to make the contacts with other administrative personnel. In smaller communities, the principal of the school or the superintendent would logically be directly approached.

The extent and seriousness of the initial interview will be determined largely by the administrator. Nevertheless, the teacher should seek to obtain certain facts that will enable him to begin at once his preparations for successful service. Some of the items needing attention are: (1) a definite assignment as to scope of work and subjects he is to teach, (2) the school or shop in which he will be located, (3) means and methods through which he may have access to his shop and equipment, (4) availability of recorded materials in the form of courses of study, outlines, invoices, and the like, (5) suggestions with reference to possible expansion of program and increase in equipment which may demand immediate attention, and (6) an indication of correct administrative procedure in connection with his professional routine.

The inexperienced teacher is justifiably concerned with how to respond in these early interviews. Many teachers with experience have apparently learned little of desirable techniques. Hence the following suggestions:

1. Do not prolong the interview beyond the time indicated by the administrator. There are few surer ways of losing the esteem of a superintendent or principal than to display a lack of ability to leave as soon as the business is transacted, or as soon as one has used up the time which seems to have been set aside for the interview. There are many signs through which the suggestion to leave may be recognized.

The ease with which subsequent interviews may be obtained as well as many other advantages are closely related to the teacher's good judgment as expressed in the first interview.

2. Do not try to be too familiar. Some administrators carry on a very informal type of conference; others will be offended by too much freedom taken for granted upon first acquaintance.

3. Avoid calling for a definite statement as to budgets or exact amounts of money available for the work. Chances are strong that if needs are clearly shown after a survey, the question of available funds is a flexible one. This is particularly true if the teacher is dealing directly with the superintendent, but also holds good to a large extent in a person's contact with a supervisor. A general indication from the administrator is better here than a definite statement of maximum funds.

4. Make no definite promises that may later lead to embarrassment. This applies not only to such matters as producing projects and equipment for the school, but also in reference to extra-curricular and social activities. Making promises at this time regarding membership in clubs and lodges, church attendance, and similar matters often leads to later regrets and misunderstandings.

5. "Be a good listener" may well be the guiding advice in this connection. Talk more after the needed information is at hand. This does not mean, of course, that the opportunity may not come for definite comments by the teacher, but such should come only upon rather clear invitation.

With the first interview concluded, the strain of the adjustment process is somewhat relieved and the teacher is now ready to continue his preparation for starting the year's work.

Filing the Teaching Credential

Teaching credentials granted by the state board of education in the state where the teacher's professional preparation

has been completed are a part of the equipment of the new teacher. Often he will fail to realize, however, that possession of this official document is not enough. It must be presented to proper authorities before appointments become official and salaries can be drawn. The school administrator who has hired the teacher will give information regarding proper procedure in filing the credential. Teachers moving from one state to another should not take for granted that their credential is automatically acceptable for their new position.

Looking up Records

Records will probably be available at all schools indicating enrollments and other valuable data regarding students. Such records should be used by the incoming teacher as a means of learning about numbers in previous classes, ages of students, and other details. It will furnish, also, valuable information when ordering supplies, planning work, preparing material for classes, and in other activities.

If the predecessor has fulfilled his duty in regard to records, there will not only be available the information already mentioned, but also a record of the articles made and the product turned out by each individual or class. This record may be found in the form of progress charts covering also the grading of the work, or in the teacher's record books.

Checking Inventories

The new teacher will safeguard his own interests as well as those of the school by obtaining copies of inventories and lists of supplies. From these inventories he should proceed to satisfy himself that all items listed are actually turned over to him. Since that record was made, vacation time has intervened, with the possibility that a part of the equipment has been used by janitors and other workmen, not to mention

the fact that, during the rush of the closing days of school, many an inventory suffers from hasty compilation, and from being handled by students.

With the inventories of the past year in the new instructor's hands, he can proceed intelligently to locate the equipment that will be under his care and to put it through such reconditioning processes as may be required. Too much emphasis cannot be placed upon the necessity of a detailed investigation in this respect. Tools and machinery that will not function during the early days of the semester are obstacles to successful work, and direct evidences of lack of foresight on the part of the teacher.

The hit-and-miss fashion of going about the shop to pick up whatever "loose ends" one may find is not an efficient method for reconditioning a school workshop. Too many teachers waste time by employing this method, working around in a circle and coming back to the starting point with the job half done.

Using the inventory as a guide, one can proceed systematically to check each item listed. A special chart should be made up for noting the condition of each tool or machine, with a column in which to specify exactly what needs to be corrected by purchase or repair in order to put it in first-class condition. Failure at this time to record numbers and specifications of the parts to be purchased, or of the manufacturers of the article, with all other data necessary, will inevitably cause loss of time in doing over a job which has been so nearly completed otherwise.

The task indicated here may not be a small one; but to perform it conscientiously will result in (1) having a new and accurate inventory for the beginning of the year, (2) being able to order all needed repair parts for tools and machines, (3) locating all necessary preliminary work to be done on the equipment, (4) avoiding future misunderstanding

regarding the amounts and condition of equipment, and (5) impressing the supervisor or administrator with a businesslike method of procedure, an impression which will lead toward confidence and trust for future days.

It should be said here that unless the teacher who returns to his previous location has done this work before leaving at the close of the year, his job is not essentially different from that of the new instructor.

Ordering Equipment and Supplies

When the survey of equipment has been completed, the next step should be to obtain the items which have been listed as missing. In addition to these, there may be reasons for asking for other new equipment for which there appears to be immediate need.

While the larger number of schools or school systems have some person acting as purchasing agent, it often happens that the instructor is authorized to make certain purchases directly from commercial firms. In either case the instructor should be aware of the necessity of specifying completely and technically every article to be purchased. Time is wasted by the instructor, and patience is lost on the part of the purchasing agents and merchants, through careless and incomplete orders, to say nothing of the unfavorable impression of the instructor that is established. Failure to insert a necessary figure or specification in the original order can delay equipment for months, while students are kept waiting and serious disciplinary and other problems develop.

The teacher should know how to specify tools and materials; or, if he does not know, should find out before his orders go in. It is not wise or ethical to leave it to the purchasing agent, or even to the supervisor, to check and complete items listed on requisitions. The teacher will be con-

sidered responsible in this respect, and he might well keep in mind that these requisitions constitute evidence of efficiency, or lack of it. As a help it is advisable to obtain standard order blanks from firms selling the various types of items and to consult catalogs for all tools. Failure to know, for instance, what "length" means as applied to files, chisels, screw drivers, and other tools has created many awkward situations.

The problem of estimating quantities of supplies involves additional detail. Records of types of work, enrollment, and other details of previous years, as well as those indicating enrollments and new plans for the coming year, furnish the most satisfactory basis upon which to act. Some school systems are demanding that supplies be specified for the entire year or at least for a semester, while others offer the opportunity of ordering quantities as needed from time to time. If the former system prevails the teacher can do nothing but estimate, upon best available data, the maximum needs, and act accordingly.

Careful analysis should be used, however, rather than a blind guess at demands. If the instructor will obtain estimates through the detailed process of figuring the needs of one individual student in each prospective class according to the activities contemplated, he will come close to actual needs.

What has been said with reference to specifications under the heading of ordering equipment applies also to supplies. Too much care cannot be exercised in making requests specific and in conformity with common practices. It is rather late, after useless material has arrived in the shop, to wake up to the fact that faulty specifications are responsible; and an attempt to place the blame on the purchasing agent will not help matters.

Discarding the Old

To what extent a new teacher should feel free to recom-

mend or institute changes for the first year is a problem that troubles both beginning and experienced teachers. Every instructor who is interested in his work is likely to see opportunities for changing existing conditions toward what he considers more successful teaching. How far to go in this direction will depend upon a number of factors. The following points may be given on the affirmative side:

1. The instructor will be of more value to the school for the first year if allowed to use his own ideas or plan of organization, and his own methods of carrying out these ideas, than if he must conform to some, to him, less workable scheme, originated by a predecessor.

2. If his contributions are of value to the school system and to the students, it is unfair to wait a year to put them into effect. A year of the teacher's time as well as that of the school would be lost as far as these ideas and practices are concerned.

3. Money may be saved immediately by making such changes. The previous teacher's pet schemes might have been tolerated in the presence of their champion but appear unjustifiable to others.

4. Teaching conditions may be bad and need immediate attention.

5. Wise reorganization gives the teacher an opportunity to show his ability and establish confidence for himself in the mind of the administrator.

6. Students may actually demand changes in order that they may feel justified in enrolling for further work in the department.

7. Reorganization of the budget may call for changes in the work.

8. The teacher may have been hired for the purpose of reorganizing the program and putting new life into it.

9. With the coming of a new teacher the students expect

a variation in the program. The psychology of the whole situation favors changes with reference to both students and administration.

10. If the teacher has accepted a job within the field of his specialty, he has a right to assume that he is qualified to improve existing conditions, or he should not have been hired for the job.

On the negative side of the question the following suggestions may be considered:

1. The teacher should first prove his ability, and establish confidence on the part of the administration, before proposing changes.

2. Lack of knowledge of local conditions will stand in the way of intelligent action at this time.

3. The proper morale of students and their support must be established before attempting any revolutionizing of the program.

4. Confidence of the administration can best be established by following out existing programs intelligently, rather than to appear critical of existing conditions.

5. Too rapid changes at this time tend to lead to criticism and suspicion on the part of administration and co-workers.

6. There is danger that the teacher may be inclined to make changes simply in order to make a showing and attract attention.

7. It is much better not to start a thing than to run up against unforeseen difficulties and leave the job unfinished.

8. There is danger of overbuilding the program, with subsequent damaging reaction on the part of administration and the public.

Local conditions should, of course, be studied in order to determine whether the positive or negative arguments offered here should lend the most weight. No rule can be made to apply to all situations. It is probably just as bad to be totally

lacking in the spirit of adventure as to be overprogressive and have one's judgment questioned next time. No efficient teacher is likely to stay a year on any job without finding it desirable to make changes both in content and in teaching procedure.

Conditioning Equipment

In too many instances students are annoyed and their interest is diverted in the early part of the school year by the fact that equipment is not in working order. Dull tools, that no experienced workman could use successfully, machines that are both unworkable and dangerous, paint brushes left drying up from last semester, and toolrooms in which not even the teacher can find anything are but a few of the "interest killers" to which beginning students are often introduced.

The teacher who has once experienced the rich rewards that come from time spent in putting the shop in order is sure to invest all the necessary effort needed to give his students a proper start. With the possible exception of some advanced classes, the teacher should not leave tool sharpening and similar work for the student to do as an initial activity. Not only are beginning students unable to do work of this type properly, but such assignments are too foreign to the purpose with which these students are embued.

Attention should be called here to the fact that some larger school systems hire maintenance men to overhaul and condition all major equipment, including saw filing. This does not relieve the teacher, however, of his responsibilities, nor from a great deal of personal work in connection with remaining chores.

What to Teach

One of the first questions that will be asked of the new

teacher on the first day of school is "What shall we make?" The wise teacher will anticipate this question with its broader implications covering the necessity for having courses of study in some form in his possession before he meets his classes. Even in systems where supervision is provided, teachers cannot expect to be handed detailed instructions and plans for all projects or activities. Hence it usually falls upon the teacher to furnish his own instructional material, and fortunate is the one who has provided himself with a collection of blueprints and sample projects, courses, outlines, and the like upon which he can draw hurriedly for ideas and details and which may be used as basic material for future reorganization after interests and needs of students are better understood. Suggested procedures in making courses of study will be found in Chapter XIII.

Special Meetings and Institutes

In addition to the details pertaining to the teaching of his classes, the new teacher will be called upon to respond to many of the more general activities incidental to opening of the school years. Some of these are the following:

1. *Faculty Meetings.* A new teacher is not always given the special instruction and notification regarding such meetings that he may expect. Methods of spreading information about such special meetings which seem sufficient to call the permanent faculty members are sometimes unnoticed by the newcomer. Whatever the reason for the new teacher's absence from such meetings, the fact remains that he failed to appear, and while later explanations may partly clarify the situation, the instructor is at a disadvantage at the outset. It is well then to be diligent in search of information regarding meetings and conferences and to dismiss, once and for all, the attitude that says, "If they want me, they know where I am!"

2. *Institutes.* So-called "institutes" constitute another form of meeting that teachers are asked to attend. Some teachers of shop subjects have the feeling that these institute programs have nothing of value for their work. This might be true if the scope of activities of a teacher were not greater than the confines of his shop. In the first place it may be realized that the teachers of Latin, English, mathematics, and other subjects probably have just as much reason to feel the same way about some meetings, and if the shop instructor has a right to stay away the same right should be accorded other instructors.

Each instructor is in need of much general, broad information bearing on problems of administration, subjects and methods used in other departments, and means and methods for making the entire school program harmonious and efficient, in order that he may be of the greatest possible value as a member of the organization. For these reasons much of the feeling on the part of teachers that institute programs have in them nothing of value is without justification.

3. *Assisting the Administration.* Assistance in enrolling, interviewing, and scheduling students is another duty which is likely to fall upon a great number of the instructors. Some persons prove themselves more valuable at this point than others. Some shun these duties if there is a possibility of doing so; but in this way they stamp themselves as being less useful in the school, and less likely to be thought of in connection with more responsible positions. A teacher who is interested in building up a department will welcome the opportunity to make personal contacts with students outside of class hours and with prospective students at all times.

Home-Room Duties

Another assignment for the new teacher which needs preliminary planning is that of the home room. This assignment

is likely to be relatively foreign to industrial arts teachers, and for this reason much preparation may be required for it. While it may be true that not all teachers are required to take on such a responsibility at the outset, the assignment is sufficiently common to be listed as "usual." Valuable books and references are available on this subject and some can usually be had at the school library. Teachers with experience may be consulted. If the teacher is aware of the fact that he may suddenly be thrust into a home room on the first day of school, he can find material and information from which to plan definite procedures and programs for this activity. For further discussion of the home room, see Chapter XV.

Checking One's Readiness

As the final important touch in the program of preparation, comes anticipation of the first class meeting and the needed set-up for a successful first contact. Here the test will come of practically all qualities desirable in a teacher, as well as of all the acquired skill and adaptability he may possess.

The chief things to be tested, however, will be his ability to foresee, and his skill to prepare for that which he has foreseen.

As a check upon one's readiness to meet the class for the first time, the following points may be of value:

1. Visualize the class as fully as possible, as to age, training, temperament, aptitudes, and the like. Previous records will assist here.
2. Be certain that equipment and tools are in perfect condition.
3. Have a definite plan for the work for the semester.
4. Have materials on hand and ready for the first piece or pieces of work to be done.
5. Have a lesson plan (preferably written out) for procedure for the first class meeting.

6. Have the needed tools and other devices on hand for the first lesson.

7. Be ready to assign students to working places and lockers.

8. Plan a definite method for getting acquainted with the class.

9. Prepare to be glad to see the students arrive, and to let them know it. If a teacher is not glad to see the work start, he should quit and let someone else take his place.

10. Have a definite plan for standards of order and discipline, and be prepared to put this plan in operation from the start.

The Instructor Meets the Class

After a program of preparation of the type discussed on previous pages, the instructor has reasons for anticipating a definite and effective start in his work. If his foresight has been comprehensive and analytical, and if his heart is in the work—in short, if he is a true teacher—he should now be ready to meet face to face the groups that will be under his care for a specified period of time.

The importance of the first meeting with the students cannot be overemphasized. At this initial contact impressions will be received by the students and attitudes will be established which will be large factors in determining the quality of success to be experienced for a period to come. The students will make up their minds during the first meeting whether or not the instructor is a "regular fellow" and deserves their coöperation. It may be possible that such impressions can be changed at a later date, but the important thing is to make the first contact with the students such that the results of it are wholesome and lead toward coöperative feeling between teacher and students.

While native traits and characteristics and qualities of per-

sonality on the part of the instructor count much in gaining coöperation from students of all ages, it is also true that methods and planned procedure form a good second set of factors. Personality will not function long in place of a program. But personality, plus a program for suitable, well-thought-out procedure, makes an admirable combination.

The following suggestions are made for procedures in meeting a group of from 24 to 30 boys of junior-high-school or early high-school age, for the first class period.

1. *Start something before the students do.* When the boys arrive they are ready for action; the teacher should be ready also. If he stays in his office three minutes too long, the whole performance may start off in the wrong direction. The instructor is the safest center of attraction at this time. He can be engaged in doing something that attracts the crowd, even though it be as simple a thing as to hand out cards of an attractive color to be signed later, or talking to early arrivals about some phase of the work. To focus the attention of the students on a central point until the class can be called to order is no small task, but is a very important one.

2. *Get acquainted.* This important feature is often overlooked. It applies both from the student's and instructor's angle. Too many students of the timid type will not feel at home in the shop and free in their earlier attempts, because they do not know the instructor and their classmates. Simply to take the roll call is not sufficient in this connection.

It is just as important for the students to know the instructor's name as it is for the roll of students' names to be in the hands of the teacher. If the latter's name is not clearly presented, this again promotes reticence among some students in approaching the instructor. Let the teacher introduce himself as he wishes to be addressed by the students, pronounce his name so that all can hear, and then write it on the blackboard as an additional help. The teacher's name imprinted on his

SANTA BARBARA CITY SCHOOLS

FIG. 1. The home room may be composed of industrial arts students, or a cross-section of the school. This picture shows a subscription drive for the forthcoming yearbook—a typical home room activity.

SANTA BARBARA CITY SCHOOLS

FIG. 2. Safety practices is a good topic for discussion for the first meeting of the class.

FROM "SAFETY INSTRUCTION IN INDUSTRIAL ARTS." CALIFORNIA STATE DEPARTMENT OF EDUCATION

FIG. 3. A student group discussing accident prevention in the school.

LOS ANGELES CITY SCHOOLS

FIG. 4. High interest is maintained by limiting class discussion in the early part of the course and getting the class into manipulative work.

SAN DIEGO CITY SCHOOLS

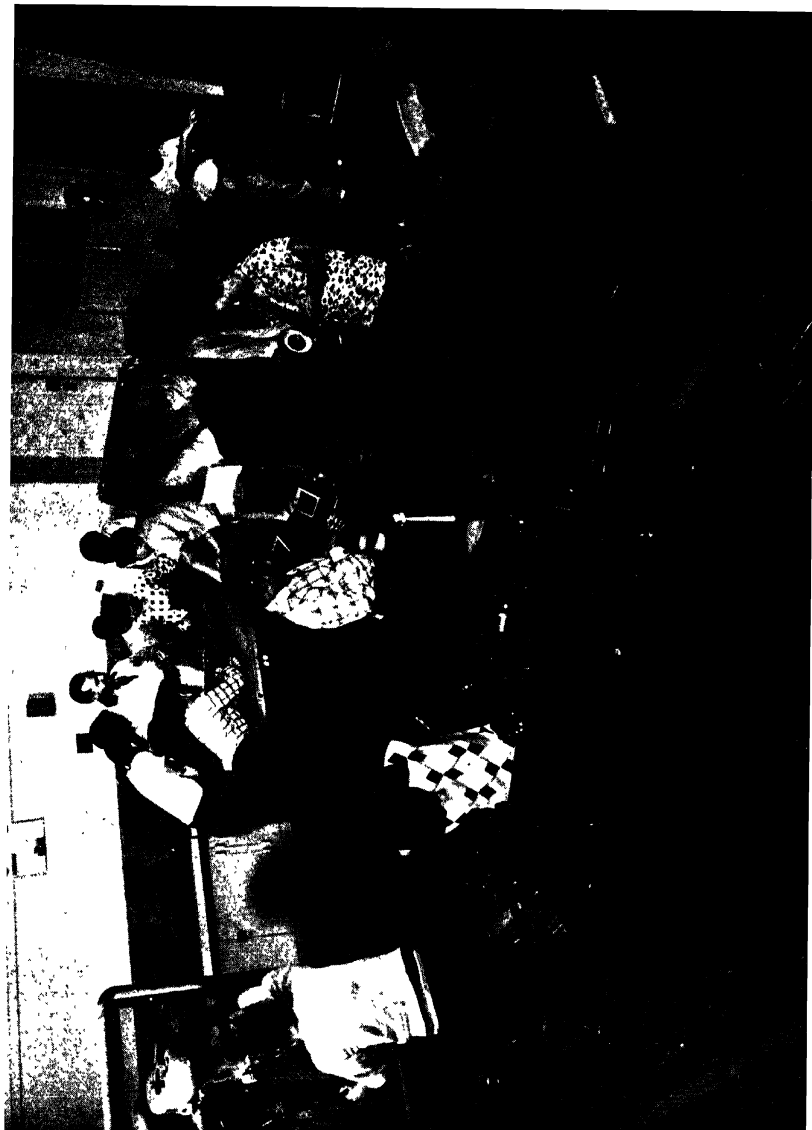
FIG. 5. The class demonstration is a basic teaching method in industrial arts. It should be preceded by thorough planning.

SAN DIEGO CITY SCHOOLS

FIG. 6. The group demonstration is useful as a review of the class demonstration, and is an essential procedure in the general shop.

SAN DIEGO CITY SCHOOLS

FIG. 7. Good chalkboard illustrations lend interest to the lecture or talk method of teaching. Such drawings will clarify points that are hard to observe in actual demonstrations.

shop coat will aid in the process. Boys are keenly interested in their teacher, if, indeed, they are allowed to be; and with intelligent treatment such interest will soon develop into profound respect.

3. *Recognize pupils.* In order to carry this acquaintanceship further, the teacher could go so far as to allow the boys to introduce themselves to him and to the rest of the group, and perhaps tell something of their experience, particularly in shopwork, both at home and in school, or about their pets, hobbies, and other interests. Such procedure might well create a new and refreshing schoolroom atmosphere, something surprising in the experience of boys. Such a method might easily be the means of getting started with a truly coöperative spirit among students as well as between students and teacher.

4. *Discuss values and purposes.* Too many students take courses in all grades without knowing just why they are assigned to the class or subject. It seems reasonable to assume that a little time can profitably be spent during the initial period of any new course, or with new students taking any course, in discussing frankly the purposes of the work and the outcome that may be expected. Such presentation should obviously be kept on the level of pupil interest. But boys and girls of junior- or senior-high-school age may be expected to take greater interest in the work if they have a chance to know the reasons why adults have decided that this particular subject will make a valuable contribution to their education. Many of the commonly listed aims or outcomes for industrial arts are not too difficult for students to understand and appreciate. Incidentally, it might clarify the purpose of the teacher to force himself to list desired outcomes in phraseology suitable for presentation to his students.

5. *Review course content.* As early in the course as possible, preferably at the first meeting with the class, it is well to acquaint the group with the nature of the work that is

to be covered. Some teachers hesitate on this point with a feeling that the plans presented will not seem attractive, and that students may tend to drop out. In response to such feeling it might be said that if the teacher has prepared a course of study which is properly gauged for the students to whom it is presented, there should be no danger of lack of interest.

It should be kept in mind also that the attitude displayed in the presentation of the plan will probably have more to do with its acceptance or rejection than the content of it. A tone of voice or a general attitude that permeates the whole presentation with a "take-it-or-leave-it" atmosphere will not color the course of study, or the projects to be made, with attractive qualities that will make them interesting to students.

Establishing Coöperative Attitude

To preach constantly about rules of conduct in the school or shop is poor practice. To make no attempt to arrive at a coöperative attitude regarding conduct is still worse. One of the very first considerations that must of necessity be placed before the class is one covering attitudes toward the shop and suitable personal conduct. Here, again, success in obtaining results comes not from declaring rules and regulations but rather from a sympathetic explanation of conditions which exist. A few suggestions for the approach to this topic which have proved helpful in classes of young boys are presented in the following paragraphs:

1. *Show confidence in the boys.* A feeling set up within the boys that they will be treated and dealt with as responsible individuals is half of the success. With such a feeling not many students will consciously violate established regulations, and the offenses that take place because of lack of maturity and judgment are not the ones that cause the grief. The value of putting a boy upon his honor has not been fully

realized in schools. That there are exceptional situations under which these suggestions may be less effective is not to be denied, but with all normal boys their value should not be overlooked. While this is not all there is to the problem of conduct and discipline, it is an important starting point.

2. *They come for work.* It is wrong to approach a class with the feeling that their chief interest is assumed to be in play and mischief. That may be the case if nothing else is provided for them to do. But the average boy or girl comes to the classroom and workshop for an opportunity to work and learn. If the teacher will start on this assumption from the outset, and provide abundant activity, he will have little reason to be concerned about anything else. How to get the students away from the work when the class period is over will soon become a greater problem than how to keep them working, if the instructor has the right viewpoint and the right approach. Do not assume that they will play in the shop, and probably they will not.

3. *The equipment belongs to the students.* A wholesome attitude toward tools and equipment can usually be established through a presentation of the idea that the tools are placed there for the students. They are available for their use and care. They are no different from tools in their own or their fathers' workshops. They were paid for by tax money, and tax money is contributed to by their parents.

These tools will be only as good as the care that they receive. No student can expect anyone else to treat the tool which he will use next any better than he is treating the one someone else is to use. Consequently, there is little or no difference between having a tool kit for each individual and having a much larger tool kit for a group. It simply makes it possible to have many tools which otherwise could not be had, and, because of this, opportunities are opened for doing varied and better work.

Such a philosophy presented even to very young students has seldom failed to establish the proper outlook upon the work; and instead of the feeling of "grabbing something and using it rough" has come a new viewpoint concerning public ownership.

4. *Their safety is at stake.* It is not a difficult task to impress students in shop classes with the fact that some rules for conduct are made purely for the safety of the student. Whether he fully understands the reason why he must secure individual permission each time he wishes to use certain tools or machines is not so important as his understanding that his whole future health and happiness depend upon his obeying the rule. This does not mean that explanations of all rules should not be offered, but rather that tools and machines have no human leniency in their make-up, and that, for the future good of the individual who is not now mature enough to appreciate the danger, these rules must be respected. Safety practices and procedures are further discussed in Chapter VI.

5. *Instructions must be specific.* To talk about matters in general and make no definite conclusions in particular is probably an important cause of lack of proper response to suggestions for behavior in the shop. Teachers fail at this point, because, after all that was said, students are not absolutely sure of what was meant; and even if they know in a general way, they were not specifically impressed to the point that impression results in action. Pointed presentations, then, are basic requirements for success in all teaching, but are even more keenly needed in connection with preliminary suggestions for rules of conduct and response at the beginning of the school year or term. Not too many rules for conduct, but a few rules so presented that they are understood as fully as possible, and accepted by the class, should be the objective before the teacher.

"When Do We Go to Work?"

It is of utmost importance to the early success of teaching in the shop to allow students to go "on the job" at the earliest possible moment. Let us remember that in the boy's mind the school shop stands for an opportunity to *make* something. While that conception must be broadened later by tactful planning on the teacher's part, it will still remain that shop teaching makes its unique contribution in education through activities. To attempt to substitute *talking* for *doing*, particularly as an introduction to the semester's work, is to fail to take advantage of the most fundamental and valuable of all characteristics with which students are endowed.

It is highly important that uniform bases for response and behavior be presented and accepted at the earliest possible moment, before individuals have to be dealt with as offenders or before bad habits have been established. But the custom of some teachers to "drag in" theoretical discussions, and teaching names of tools and parts of tools in large numbers as necessary preliminary knowledge, is often an uncalled-for means of disappointing students and killing interest.

Some teachers purposely defer definite demonstrations and actual work for the reason that they expect additional enrollment during following meetings and consider it a waste of time to go on with the work. Such teachers may well ask themselves the question whether one can afford to cool the enthusiasm of from 80 to 90 per cent of the class while waiting for the remaining few. Of course, it is extra trouble to repeat instructions to late-comers. But why should those arriving on time be punished for being punctual?

If the first class period consists of 90 minutes or more, then it is quite possible and entirely feasible to get to the point of giving a demonstration covering at least one unit of activity and in many cases allowing the class to begin to carry it out.

While shop demonstrations are discussed at length in Chapter II, it may well be stressed here that the first demonstration, however brief it may be, is probably the most important one that the teacher will make to the class. It should be fully organized, and based upon a complete analysis of the job involved and the expected responses of the students, suitable in all respects to the level upon which the members of the class are expected to respond in thinking and action. A haphazard presentation, obviously given because there seems to be nothing else to do, will start the work in the wrong direction and make a poor impression in the minds of the class. In some cases where the teaching content provides for activity under larger coördinated units, or where a general-shop program is involved, students may get into early activity through instruction sheets, through investigation of projects to be made, or through the help of advanced students in the shop. These approaches are discussed further in other parts of this book.

Related study and information can and should be brought in with great profit as the progress of the work may allow; character training and coöperative responses may be developed unconsciously to a great extent; but without definite manipulative work at a very early stage the program is not likely to get under way as it should.

Gaining Time by "Losing" It

A word of caution against overanxiety to have students get into the work at once may be in place here, although it might seem to be in contradiction of statements made in previous paragraphs. There is no actual contradiction, however, for it is obviously just as bad to send students to work before they are ready as it is to hold them in drawn-out preliminaries. Too much in the way of explanations, lec-

tures, and demonstrations will kill interest; too little may fail to arouse it. Inadequate directions may result in failure to maintain it, because the student is at once faced with difficulties that seem to him to be insoluble.

If, after the class has been allowed to go to work, it becomes evident that there is no fundamental understanding of the problem, no common basis for procedure, and no organized plan for action in the student's mind, the instructor has probably failed to take time to create atmosphere—to set the stage. It pays to "lose" some time at the outset with the idea of gaining it back later on.

Fifteen minutes of time well spent in giving information to the class may result in the saving of hours of time by students, to say nothing of the teacher's time saved by not having to correct a faulty start. Lack of understanding results in lack of coöperation; and both are directly caused by lack of painstaking effort on the part of the instructor to lay a basis for intelligent response.

The Slow Learner

There is a strong feeling possessed by many teachers that their shops have been made a "dumping-ground" for the misfits of the school system, with consequent resentment against the practice. Since this feeling is usually rekindled at enrollment time, a brief discussion of this problem may be in place here.

If by "dumping-ground" is meant the assignment to shopwork of students who have been pronounced failures elsewhere, the statement pictures just exactly what often takes place. But why register a complaint because such students are directed toward the shop? There are two probable reasons for this feeling. The first is that students of the type mentioned have been classified as "inferior" in their reactions to Latin, mathematics, English, and other so-called academic sub-

jects, and because of this the shop teacher feels indignant that he should be called upon to care for the "educational wastebasket." A second reason, and one which the teacher might not always wish to admit, is that he does not want to have to bother with special cases. He has his work planned for the average, "regular" student, and cannot take time to react to "special" types.

But if we look a little deeper into this problem, it may change appearance. In the first place, to transfer the stamp of "inferior" with a student who is transferred from an academic department to mechanical work may not be justifiable. To be sure, there are success qualities without which no person will make progress as a student or in later life. Judging a student's aptitude from the standpoint of the I-Q attached to his record is not safe, however, outside of the traditional school program, if, indeed, it can be considered safe within that realm.

Interest in the work is an important prerequisite for success in it. Interest is, with some people at least, largely dependent upon a realization of usefulness of the subject studied or work performed. And just at this point appears an important factor in connection with the question of the "dumping-ground." Thousands of students have left school under the stigma that they could not "make the grade," and many of these have later made outstanding success in their work in industry and business. Cases of nationally known people of this type are too many to enumerate. This fact should serve as a reminder that because a student does not avail himself fully of the "regular" school program he is not necessarily inferior as a future producer or a member of society.

The second reason given, namely, that the instructor has no time for the student who lacks a reputation of conforming to the program, has probably been shared by all other teachers in the school. The teacher of each of the subjects which

has been tried previously had no time for "different" individuals, and so it is probably true that no one has had time to learn much of anything about Johnny Jones except that he asks too many questions, or fails to become interested, or uses up too much energy in doing mischief.

With the coming of "special" students to the shop there are only two possible responses that the teacher can make. One is to take the attitude of those who "dumped" them; the other is to accept the challenge. If accepting the challenge, it is not difficult to see in the "educational wastebasket" a chance for turning out a new product. Then, instead of a dumping operation, the problem becomes one of rehabilitation.

Even in cases where there is admittedly no great talent—mechanical or otherwise—but where interest can be established through manipulative work, there is an opportunity in the school shop for the teacher who is sympathetic with the problem.

However, in fairness to the teacher with an overcrowded schedule, it should be said that working conditions often make it impossible to find all the time necessary for special attention for students of the type discussed here. Obviously there should be time for special work with special people if results are to be expected. The workshop is no doubt a promising place for rehabilitating students who have lost interest in school and lost confidence in education; but without available time for personal attention not much effective work can be done.

A New Type of Shop

A special shop or laboratory should be provided in every large school, the most attractive in the building, for the purpose of interesting noninterested students. In this shop there should be a teacher who is a good mechanic, but more than

that. He should be a teacher, but not of the type that the incoming students had previously run away from. Boy-Scout philosophy should be the basis for his dealings with his students. He should have wide knowledge of many occupations, but his knowledge will make him the more humble and willing to let the boys work out their own destiny. Analysis of human nature will be his chief function, and his workshop will be used as a laboratory for accomplishing it. As soon as students find an interest in school and life and vocation, they may be transferred elsewhere. Many will go back to the academic work whence they came with new vision of the personal values of an education. Others will go into the shops for vocational training; while others, without stigma, will be guided into jobs outside of school and followed up in their occupational work.

PROBLEMS AND QUESTIONS

1. Make a list of questions that a prospective teacher of shopwork may ask the superintendent before signing the contract.
2. What would you reply to the suggestion of a prospective employer that industrial arts should pay for itself in the school?
3. If in an interview with a prospective employer, you should be asked to state the difference between industrial arts and vocational education, what would you answer?
4. List all of the means through which a new teacher may get information regarding the number and character of students for various classes.
5. What ethical activities may a teacher engage in before school begins, to insure an enrollment in a new class of shopwork?
6. What would be your reply to the statement by a prospective employer that "no one can teach industrial arts well unless he has had extended practical experience"?
7. Make an analysis of the things a teacher may do between the time of signing his contract and arriving on the job which will better prepare him for his new position.
8. By what means can a new teacher learn what is his reasonable share of extracurricular and community activities?

9. Make a list of values that you, as a new teacher, would expect to realize from local institute meetings before the beginning of the school year.

10. List all subjects that your teaching credentials entitle you to teach.

11. What may be done to secure a coöperative attitude at the outset from an especially unruly-appearing boy in the class?

12. Make a sample of a special card which may be filled out by junior-high-school students the first day of school for the information of the teacher. Do the same for senior high school.

13. Make a list of cautions for an inexperienced teacher to keep in mind the first day of school.

14. In what subjects or activities in industrial arts do you think it feasible to start manipulative work the first day?

15. What would you think of furnishing manufacturer's charts, and drilling students on the names of the parts of tools, the first day in shopwork?

16. If the instructor provided mimeographed copies of shop rules and regulations for distribution to the class, would there be need for discussing them? If so, why?

17. What should the new teacher do if his inventory of tools and equipment did not agree with that turned in by his predecessor?

18. What danger is involved in attempting to make attractive the course of study to the students the first day?

19. What do you consider the best way to learn pupils' names quickly and to help your class get acquainted?

20. To what extent should one show confidence in boys with reference to custody of tools during the first part of the work?

21. Give reasons why it is important to give the first demonstration with extra care.

22. Would you expect boys to have developed the proper attitude toward school tools and equipment from observing the general attitude of the public toward municipal and state properties furnished for parks, beaches, camping grounds, etc.?

23. In the teacher's mind, which should be more important for the boys—"making something" or "learning something"? Why?

24. Under what conditions do you think that the industrial arts teacher may justly complain that his shop is being used as a "dumping ground"?

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Chapter II

METHODS AND PROCEDURES IN TEACHING

Teaching Methods in Common Use

A comprehensive study of available literature in the field of teaching will reveal extensive listings of so-called teaching methods as conceived and classified by various authors and groups. As presented in this chapter, however, teaching methods will be confined to a number of generally accepted teaching practices and procedures which appear most suitable for shop or laboratory instruction.

With this thought in mind, the fundamental teaching methods which will receive special consideration are the following five:

1. The *demonstration* or *showing* method.
2. The *lecture* or *telling* method.
3. *Printed instruction* or *book* method.
4. *Discussion* or *conference* method.
5. *Discovery* or *problem-solving* method.

These five methods are presented here because they are considered to have more distinct characteristics for teaching in industrial arts than others found in educational writings. It is evident that it would not be necessary or even desirable to confine a teaching situation to the use of any one method. Basic elements of several of these approaches may appropriately be combined for best results depending upon the age of students and type of subject matter being taught. The skillful teacher will use these methods in such rotation and combination as will be indicated by existing needs.

The Demonstration

From the time that instruction in the manual arts was in-

troduced as a school subject, the demonstration has stood out as the most definite and valuable means of instruction. It continues to be so whenever it is desirable to have students learn exact and acceptable procedures in mechanical operations. Its success is based upon imitation as a factor in learning, and it is a well-known fact that imitation is a natural instinct which figures greatly in all types of education.

The shop demonstration as performed by the skillful teacher is unfailing in developing and maintaining interest among students for various reasons: (1) There is an appeal to the sense of vision; (2) skillful performance in hand manipulations always attracts attention; (3) students see immediate progress as result of effort; and (4) a desire is aroused to emulate the work of the teacher.

The demonstration, then, is probably the teacher's greatest asset in arriving at fundamental skills and practices and in the shortest possible time. It may well be said that, for the average school shop, the quality and quantity of work produced will depend greatly upon the instructor's use of the demonstration.

Ability to perform in industry, or expert craftsmanship on the part of the teacher, is not a sufficient guarantee, however, of ability to demonstrate to others, necessary and desirable as such craft skill is as a prerequisite. Ability to demonstrate comes from analysis of the problem and from organization of teaching procedure, plus an intimate knowledge of those who are to learn from the presentation.

Demonstrations as used in this type of teaching may be divided into three classes, namely: (1) class demonstrations, (2) group demonstrations, (3) individual demonstrations.

Teaching Methods and Teaching Techniques

As discussed here, teaching methods are differentiated from teaching techniques. The five teaching methods listed are

thought of as broad, basic, coördinated procedures, each one sufficient in scope to be used rather exclusively for teaching segregated learning units. Techniques, on the other hand, are considered as minor resources or procedures used to give variety to the teaching process and to stimulate and maintain interest in it. Under this interpretation, the "use of questions" could be a teaching technique used in connection with the demonstration, the discussion, or the discovery method. Clever blackboard sketching would not be a teaching method but a technique for making a lecture presentation effective. The organization of the class for student participation in shop management would be a teaching technique but would not be listed as a teaching method. Teaching techniques are discussed further in Chapter V in connection with the discussion of teaching aids.

The Class Demonstration

It can well be assumed that in all groups where one subject is being taught, there are reasons for giving demonstrations to the entire class at one time. This is true particularly in the early stages of a semester or course where individual articles are being produced, and applies to the entire course when production work is carried on. Wherever this can be the procedure, several advantages may be noted: (1) the saving of the instructor's time, (2) the fact that the entire class receives the same instructions and suggestions with no chance of later discovering that some have not been given certain basic information, (3) the fact that in larger numbers, within limits, there is more enthusiasm and interest.

The need for efficiency in the demonstration has already been stressed. In addition, the following factors for a successful demonstration are presented:

1. *The class should feel a need for the demonstration.* It may be the task of the teacher to use some artificial means to

produce such an attitude; but in most cases the need for information about work which students are eager to do can be the determining factor for the time of the demonstration. It is an error to make demonstrations primarily because they had been planned in advance for a certain date. (The preparation of the student for the instruction is further discussed later in this chapter.)

2. *Confine the demonstration to a single unit of work.* Teachers often fail to analyze the instructional material into sufficiently small units. As a consequence, the demonstration becomes long, involved, and uninteresting. Emphasize a small unit and enable the class to go to work as quickly as possible after proper interest has been aroused in the work.

3. *Have equipment and material in readiness.* All devices to be used in a demonstration must be at hand. While the instructor goes to the toolroom or stockroom, or while he sends some student, attention is diverted, and the emphasis upon the unit of instruction is weakened or destroyed.

4. *Make demonstration accessible to learners.* The necessity for planning the demonstration physically so that all students can see it in detail and hear the oral explanation is not always appreciated by teachers. Even teachers with much experience fail to assume a position so that the processes demonstrated will appear normal to those who observe. Failure on the part of students to do the work demonstrated often comes from the fact that the teacher was facing the group when performing, and therefore the students failed to follow the motions of the teacher and in turn were unable to imitate these motions when assigned to the work.

5. *Use effective oral explanation.* What should have been a successful demonstration has more than once been killed by too much so-called related information. In reality, it was not related; it was foreign, and "dragged in." If it truly "relates," it may create interest. Too often the instructor is possessed

by the urge to tell about his own experiences in school or industry, or side-tracked by suggestions and questions of members of the class. To decide beforehand just what ground will be covered, and not to deviate too much, is good advice in this connection. There are cases, however, where teachers do not carry on sufficient conversation to maintain interest in the demonstration. Oral explanations and discussions are needed, but must serve to focus and hold attention upon the work at hand.

6. *Practice privately.* Every demonstration covering a new unit of work which has not been recently performed by the instructor should be practiced beforehand. It happens too often that the instructor runs against some unforeseen difficulty when he relies upon his imagination and previous experience, and thus the class loses confidence in the instructor, and interest in the work.

7. *Do not demonstrate on student's work.* It is unfair to give one individual student the benefit of the work done in the demonstration. The instructor should perform on a separate article which may belong to himself or to the shop when completed.

8. *Do not quit too soon.* It is better as a rule to give a longer demonstration, carried to a satisfactory completion, than to stop short of the goal and attempt to cover the remainder through oral directions. The proper confidence is not thus established, and the complete visual image is not received. This does not indicate that certain phases of the work cannot be carried to completion by the instructor after the class has been sent to work. But care should be taken to prevent the impression that the instructor is afraid to try to perform certain processes because of lack of skill.

9. *Use common tools.* To reserve the newest and best-looking tools for the teacher's demonstration bench is a mistake. Such tools may not work better, but they appear as if

they might, and thus create suspicion. Give the new tools to students and use older ones for demonstration. This will show that the outward appearance of tools has little to do with the work they perform if they are in proper condition. The same sizes of tools should also be used as those given to students. Incidentally, the practice of using miniature tools for younger students may be easily overdone.

10. *Give an example in accuracy.* The excuse by the teacher that he is not taking the time to do the work as well as he wants it done by the class is not always accepted by his students. No greater accuracy or better technique can be demanded rightfully at any time, either in shops or drafting rooms, than is set as a standard by the instructor's work.

11. *Use accepted trade methods.* There may be a good reason why some teachers lack trade practice in some subject which they teach. There is no reason, however, why they should not learn from industry accepted procedures used in the trade. After knowing such methods, there may be good reasons for deviating from them because of differences in objectives, ability of students, lack of equipment, and so on, but that is a different matter.

12. *Check the success of the demonstration.* Learn, before sending the class to work, whether the demonstration has served its purpose. This is probably best done by well-selected questions. To ask for questions from the class will seldom be helpful, for students do not know how to formulate them. It is easier at this point to straighten out wrong thinking than after material has been spoiled and time has been wasted by students.

13. *The follow-up is important.* The clinching feature of a demonstration lies in diligent and patient checking to see that it is put into operation. At the best, there will be need for correcting wrong impressions, assisting in establishing correct habits, and encouraging those who lack confidence to go on.

The Group Demonstration

A group demonstration differs from the class demonstration only in that it is presented to a portion of the class, usually while the remaining members are at work. Such demonstrations are necessitated by one or more of the following conditions: (1) A certain number of students in the class do not get sufficient value from the class demonstration, and some repetition is necessary; (2) in making individual projects, the processes covered may vary too much to be of use and interest to the entire class; (3) differences in ability and speed of students have caused some to be too far ahead to make it profitable for all to follow uniform demonstrations; (4) the organization of the general shop divides the class into sections doing entirely different work.

If there is a separate room where such groups may be taken aside, efficient demonstrations become much easier. If they must be given in the shop in the presence of noise and activity, the load on the teacher is increased. In planning and performance, such demonstrations have much in common with those given to the entire class. Since most group demonstrations must be repeated at some other time to other groups of the same class, it is very important to keep complete records of the points covered, in order to be able to present the same material and use the same basis for checking on the achievement of all groups. This suggestion might well be accepted for all teaching, for the instructor who accumulates data and material in organized form will soon find that much repetition of preparation of material can be eliminated, and the time so consumed used to better advantage.

The Individual Demonstration

No teacher has yet succeeded in so organizing his work that demonstrations to the class or even to smaller divisions of

the class cover the needs of all students. Neither would the modern teacher desire to perfect such an organization if he could, for to do so would necessitate an undesirable uniformity in the work. There are various reasons for the fact that, regardless of the efficiency of the general demonstrations, there is always need for teaching individuals one at a time in the shop. Variations in mechanical aptitude and in general learning ability, irregularity in attendance, differences in speed, and differences in problems attacked by the students are some of the outstanding reasons involved.

The teaching of the individual student through demonstration of work on the individual basis is stressed here because of the fact that there is a tendency to be less thorough in instructing one individual than when dealing with a class or group. Individuals who need instruction at all need the right kind, and whether one or ten students are involved, the problem is the same, namely, that of showing in detail the procedure to be followed for a certain accomplishment in manual work.

A conscientious follow-up of the general demonstration, as suggested previously, and close individual touch with students at all times will determine how much of this type of teaching is needed. If 50 per cent of the class give evidence of lacking ability to attack the problem without further assistance, the general demonstration has not been a success, and the instructor needs to revise his procedure. If 90 per cent can go on with the work without special difficulty, the teacher may be proud of his job, and hasten to assist the remaining 10 per cent.

The Lecture or Telling Method

The lecture or "telling" method is essentially the method of teaching outside of manipulative work. In the shop it is also useful, provided its place and function are known and

appreciated. Facts to be learned in connection with the work performed are often as important as the tool processes involved in the performance. To tell facts to students may be the shortest way to the acquisition of such facts. And, while the argument has been advanced that "telling is not teaching," it at least offers opportunities for obtaining useful and essential facts at a minimum expense of time. In many cases knowledge may be just as effectively assimilated as if students were to go to much trouble in finding it for themselves from reference material and other sources. Because a student takes much time to obtain certain facts is no guarantee of the increased value of such facts.

The Illustrated Lecture

Whenever possible, the lecture or class talk should be illustrated in some way. This will increase the interest in the materials presented, and give a chance for impression through various senses, sight, hearing, touch, smell. Wall charts, blueprints, samples of materials of various kinds, and motion pictures offer suggestions for illustrative materials. The illustrated lecture is particularly valuable in dealing with facts to be learned, and material related to the operations performed.

This type of presentation of subject matter must not be confused with the demonstration nor substituted for it. Some teachers are in the habit of telling how to do things instead of actually showing the operations, using tools only to illustrate their lecture and failing to carry out the actual performance of the demonstration in detail. Of course, any good demonstration involves oral explanations, but these come only as means for strengthening the manipulative processes.

A good policy to establish, particularly with students of junior-high-school ages, is to keep lecturing of all types down to a minimum, and to confine oral presentations to very brief periods. Instructors who naturally like to talk need to watch

themselves at this point. Unless there is a definite need felt by the students, or unless such need can be established at the outset, such instructors should guard against giving vent to their constant "desire to talk."

Printed Instruction or Textbook Method

Depending upon the printed page as the chief means of acquiring an "education" has been the standard method of teachers from time immemorial. In late years the value of the textbook *alone* in teaching has been seriously questioned. In the field of industrial arts the book method of teaching has been less practiced than in most other subjects, and yet there are many valuable uses for book assignments in industrial arts teaching. A more extensive discussion of the use of textbooks will be found in Chapter V.

The Use of Instruction Sheets

A type of printed material for this field which has received sufficient acceptance to be recognized in this teaching method is "instruction sheets." Instruction sheets were originally developed and used in connection with vocational classes under the title of "job sheets." The content of these sheets was organized for the purpose of analyzing and presenting instruction in printed form and thereby enabling the learner to proceed with less personal attention from the teacher. Practically all types of instruction sheets have been embodied, at least in part, in textbooks and project books, to the extent that some books of these types consist almost entirely of a collection of instruction sheets.

The introduction of instruction sheets into the industrial-arts program was probably stimulated by the organization of the general shop and the increased emphasis upon a larger variety of craft experiences to be offered. They have been accepted also as a teaching device in practically all types of

industrial-arts classes in both junior and senior high schools as well as in evening adult programs in crafts and technical work.

It should be kept in mind, however, that teaching through the use of instruction sheets has its limitations. While such sheets constitute a valuable teaching device, it is not intended that they should supersede other forms of instruction. The instructions must be prepared and the work organized with this specific method of teaching in mind. Difficulties and disappointments are sure to follow the attempt to make instruction sheets replace oral instruction and demonstrations, or to use them without corresponding readjustments in class organization.

Types of Instruction Sheets

Experience in organizing material for instruction sheets and using them in the teaching process has resulted in four recognized types: (1) job sheets, (2) operation sheets, (3) information sheets, and (4) assignment sheets. Each of these will be discussed briefly.

1. *Job sheets.* Job sheets are designed to give detailed instruction and steps of procedure for doing a complete piece of work or job which would normally require a variety of operations. If written for persons with limited background of experience, they may include, (a) a brief description of the job to be done, (b) a list of tools and materials needed, (c) a list of steps of procedure, (d) drawings and illustrations needed to clarify the requirements involved in the job, (e) references to other instruction sheets to other sources of information, particularly pertaining to tool operations involved, and (f) questions that will measure the degree of understanding as well as enlarge the students' understanding of the job. The job sheet is usually constructed on the supposition that the worker has basic knowledge of the use of tools or will get it from elsewhere. The job sheet approach is widely carried out
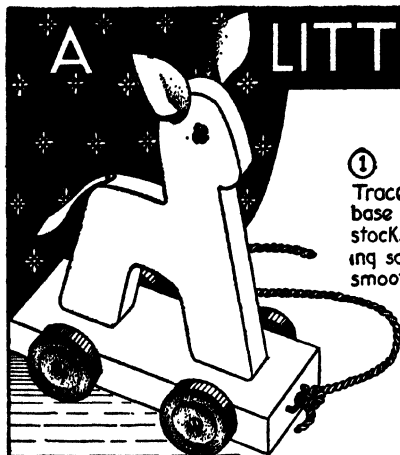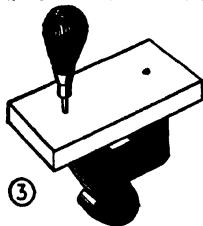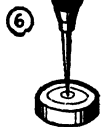
FIG. 8. Attractive illustrations create interest and clarify construction procedures. Also they reduce the need for written instructions.

in connection with popular presentations in magazines and elsewhere of "do-it-yourself" projects, all the way from repairing your kitchen faucet to building your own house. The accompanying illustration,[1] Fig. 8, shows an effective method of combining extensive illustrations with directions for doing the job. This treatment should prove especially valuable with younger children.

2. *Operation sheets.* The operation sheet differs from other instruction sheets in that it is based upon an operation or units of performance and not upon a job. Its use is applicable in all types of teaching where the instructional area to be covered can be analyzed ino units of performance, rather than into jobs, such as "how to cut a miter," rather than "how to make picture frame," or "wiring an edge," instead of "making a drinking cup." The following are typical items appearing on an operation sheet, (a) a statement of purpose for the job, (b) illustrations to clarify procedures, (c) detailed steps of procedure, (d) questions to cause thinking and to clarify understanding.

3. *Information sheets.* This type of sheet is made to cover some unit of information, and does not deal with performance or manipulative procedure. Information sheets consist essentially of textbook and reference material, organized in small units and arranged from the standpoint and needs of certain age and ability levels. Related information, occupational information, and, in fact, any of the facts to be learned in connection with the shop program offer opportunities for the use of this type of sheet. One of the values of this type of sheet comes from the fact that it may be made up to suit the needs of the individual class rather than to conform to standard books. Another value is that they present a small unit of information segregated from the text or reference book.

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[1] Newkirk, Louis V., *Organizing and Teaching the General Shop,* Chas. A. Bennett Co., Inc., Peoria, Illinois, p. 142.

4. *Assignment sheets.* The purpose of assignment sheets is to give directions for specified work and procedures to be undertaken by the student. Involved here might be, (a) assignments for investigations and written or oral reports, (b) directions for procedure in selection, planning, and construction of projects, (c) directions for making up procedure arrangement cards or charts, (d) assignment of personnel in cooperative and group projects and similar instructions. The use of this type of written instructions is valuable as compared to oral instruction in that both teacher and student have a record of the assignment and repeated reference can be made to the instructions.

Values of Instruction Sheets in Shop Teaching

When instruction sheets are properly written and properly used, they offer a number of advantages as a method of instruction, among which may be mentioned the following:

1. Instruction sheets are a means for offering a greater variety of work in the shop. Such variety could not be covered by individual, personal instruction.

2. They save time of the teacher. The time so saved can be used effectively in perfecting organization, and in other phases of the work.

3. They save time of students that would otherwise be used in waiting for attention of the instructor.

4. Interest of students is maintained, because they can proceed with the work without waiting for demonstrations and personal instructions.

5. They furnish printed directions to be followed. Success in a great number of occupations depends upon ability to understand and follow directions set forth in this way; consequently, the practice is of high importance.

6. Students are left largely on their own resources in carrying out the work. The habit of "leaning on the teacher" at

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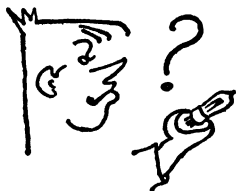
LOS ANGELES CITY SCHOOL DISTRICTS
Division of Instructional Services, Curriculum Branch
Agricultural-Vocational-Industrial Arts Education

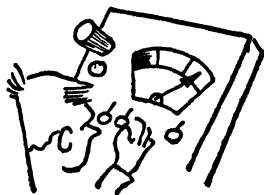
YOU HAVE TO DO MORE THAN LOOK AT A RADIO TUBE TO KNOW IF IT IS GOOD OR BAD. THE TUBE TESTER WILL GIVE YOU THE CORRECT ANSWER QUICKLY.

You will need:
- Tube tester
- Radio tubes
- Data sheet
- Pencil

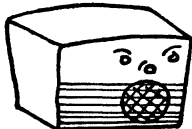
Follow the steps below and you won't "fall down" on this assignment:

1. Check out the tube tester and connect it to a 110 volt line. If you are not sure of the operation of the tester, check with your instructor.

2. You'll need a few tubes on which to practice. Your instructor will give them to you.

3. You must write down the results of your tests. Make a data sheet on scrap paper. A sample is shown below:

Tube Number	Good	Bad	Fair

4. Test the tubes, placing an X in the proper column of the table to indicate the condition of each tube.

5. Turn in the completed data sheet to your instructor. He will grade it.

WHY DON'T YOU BRING A FEW TUBES FROM A RADIO AT HOME AND TRY TESTING THEM?

Directions by William Albers, Drawings by John Scott

LOS ANGELES CITY SCHOOLS

FIG. 9. An informal and effective job sheet can be made by the teacher with a minimum of time and effort.

all times does not produce an adequate sense of independence. Our schools have been criticized by industry for failing to emphasize initiative and self-reliance.

7. Instruction sheets are of great value as an aid to and follow-up of the demonstration. They eliminate the need for copying directions, and thus enable students to concentrate upon the processes demonstrated. They also serve to establish uniform checking levels in the progress of the work.

8. They furnish uniform instructions to all students who use the sheets. Such uniformity would be lacking if the teacher were to depend upon individual oral information and instruction.

9. Written instructions in sheet form have value in that they put emphasis upon a single unit of work. See Fig. 9.

10. Segregated sheets of this type are economical when directions are needed for a specific job or operation.

If the instructional materials are not well written, or if the instructor does not have his work properly organized, or has failed to appreciate the real uses and purposes underlying this method of teaching, or if, as may sometimes be the case, he is too indifferent or careless to avail himself of this teaching device in the proper way, some of the following difficulties may develop:

Limitations of Instruction Sheets

The following are some limitations that may be listed in connection with the use of instruction sheets:

1. The instructor may accept the use of the instruction sheet as a substitute for personal teaching activities. "Get it from the instruction sheet," may be his statement to the students. He may be inclined to step out of the picture to the same degree that the instruction sheets are brought in.

2. Some teachers may be inclined to allow tool processes and mechanical performances to become less accurate, and

the standards of workmanship indefinite. Such a condition would develop from a tendency on the part of the instructor to omit definite demonstrations to his students, and from failure to check the work at prescribed periods as it progresses. This again, emphasizes the fact that for certain phases of instruction the written sheet is inadequate.

3. The argument that some students are not well able to take directions from written or printed material, or are not interested in doing so, has been raised against the wide use of instruction sheets. It may be argued that in many occupations taking directions in written form and interpreting them is not highly essential.

4. If the teacher is not wide-awake to his job, there may be a tendency toward breaking down class organization and regularity in conduct. This condition may come from the fact that there is less personal contact with individual students and that the class may not be so often assembled as a whole.

5. The use of instruction sheets may lead to waste of material and improper use of tools. These conditions may develop if students are allowed to proceed too largely in "trial-and-error" fashion, without first making definite plans before they are allowed to go ahead with the work.

6. Under improper organization there may be more danger of accidents, because of the fact that the personal contact with the instructor is less constant. This, again, depends greatly upon whether the instructor is aware of the problem, and has established a routine that fits in with this method of teaching in the shop.

7. The preparation of a large amount of instructional material becomes too great a burden for the teacher. Consequently, the material will not be well prepared and of sufficient value to the student. Also, the teacher will neglect other phases of his teaching job.

The fact might well be emphasized further that the diffi-

culties here mentioned are not necessarily inherent in the written instruction sheet, but probably arise because of the fact that the instructor is uninformed as to the method, does not have his work properly organized, is not sympathetic toward the procedures involved, or for some other reason is using the method half-heartedly or as a means of saving himself from work rather than of increasing the efficiency of his teaching.

Discussion or Conference Method

The discussion method is based upon extensive contributions of ideas and expressions from the members of the group participating. The conference technique, which has been developed to a high degree in dealing with adult groups, is probably the most fully developed form of this method. The conference method is extensively used in conducting foremanship training, and with similar groups, but it need not and should not be confined to adult programs. In various forms, the discussion method is being used for all types of subjects for all ages. It was considered a vital part of the project method of teaching popularized in the 1920's and has been stressed to a similar extent in connection with the concepts of the "creative approach," "integration," "units of work," "child-centered" teaching, and similar movements of more recent years toward democratic and social teaching procedures.

Obviously there should be opportunities for self-expression in the educational program of a democracy. Just how much this method may be used will depend upon the type of work engaged in, the objectives of courses taught, the students' age, and the general organization of the entire school. Generally speaking, large city school systems are in the best position to develop the staff personnel and facilities for the conference method.

Discovery and Problem-Solving Method

The discovery and problem-solving method is well illustrated by the boy who spends hours on the living-room floor or in his home workshop deciphering drawings for a model airplane from a magazine and who improvises ways for building it. Under instruction from an expert teacher, that model might be built in one half or one fourth the time. The question remains as to what extent it is justifiable to expect or allow students of junior- and senior-high-school levels to attempt to discover their own methods of working or to solve their own problems of procedure in doing the work.

At this point, opinion among teachers is divided. Those stressing the need for problem solving would say: (1) The traditional methods in teaching manual arts have been too dictatorial; (2) modern educational theory places emphasis upon individual thinking and self-expression; (3) industry and business are looking for persons with initiative and originality rather than blind following of tradition and directions; (4) traditional methods and even skill are less important for the rank and file of industrial arts students than traits leading to character and general employability. In the opposite direction the following views might be held: (1) In most instances in mechanical work techniques and methods of working have been established through a long period of trial and experimentation and to allow students to try to discover new and better ways is a waste of time; (2) for one person who will be in position to plan and originate work there will be ten who must follow explicit directions; (3) many students are more interested in following directions than in discovering methods for themselves and will lose interest if made to do their own planning; (4) following established methods is the best foundation for inventing new ones.

It is obvious, however, that more responsibility should be

placed upon students in industrial arts classes for thinking out and solving a larger number of problems than is commonly the practice. To take the position, however, as some have done, that all assignments in the school shop should be solved by research and discovery is obviously a short-sighted viewpoint. In the school shop there are many accepted ways of doing work that can best be demonstrated and considered final, and many established facts that can be stated and accepted with the least expense of time and effort. But on the other hand, there are many occasions for putting the student on his own in connection with applications and combinations of tool processes and factual information.

It appears likely that success in the use of this method is dependent to a large degree upon: (1) high initial interest on the part of the student in the activity undertaken, (2) a creative and inventive type of mind, (3) projects within basic experience and ability of the student, (4) reasonable length of time allowed for concentrated work or for completion of project, and (5) recognition of success or of promise of success on the part of the student.

Planning Detailed Instruction

A knowledge of available teaching methods is a valuable asset toward efficient teaching. Such knowledge is only a foundation, however, upon which the daily work of the teacher may be built. In the last analysis, teaching success depends upon skillful application of teaching methods appropriately selected and applied in daily contacts between teacher and pupil. In order to make his teaching effective, the teacher must analyze his instructional content and plan his teaching procedure ahead of time for each teaching unit to be covered, regardless of the basic method used. Procedures in analyzing technical content and organizing material for instructional use are discussed extensively in Chapter XII, dealing with subject

matter in industrial arts, and in Chapter XIII, covering organization of course of study. Techniques for lesson planning are presented in this chapter as indicated in the following paragraphs.

Lesson Planning

The lesson plan is essentially a treatment in detail of a small unit of subject matter for presentation to students. No teaching unit can be presented with the greatest measure of success unless the instructor has first developed a plan for his teaching procedure.

The course of study furnishes an outline of the major phases of the program to be followed. A comprehensive course may furnish a part of the teaching directions. Nevertheless, it falls upon the instructor to organize his material in complete form before presenting that material, and only by making definite preparation for each teaching situation can he hope to be successful in his work. Just how detailed the written plan must be will depend upon several conditions, among which are: (1) the extent of the teacher's experience in teaching this particular subject to this particular age or grade of students, (2) the extent to which he is skilled in the correct procedure from the standpoint of mechanical performance, (3) his ability to think in an abstract way through a series of steps without the use of written analysis and steps of procedure.

The beginner who is learning to instruct through directed teaching as a part of his professional training is usually required to make plans of the most extensive type. The person who, for some reason or other, goes into teaching without such a period of special training under supervision should consider it necessary to write out in full his objectives, analysis, and teaching procedure, in order that he may picture the problems involved before he has to face them. Written lesson plans are valuable also in that they furnish a check upon one's

activities for later reference. Teaching plans in industrial arts work may be divided into two kinds: (1) the comprehensive or detailed plan, and (2) the abbreviated or skeleton plan.

Analysis as a Basis for Planning Instruction

A minute analysis of the necessary operations or the facts or principles that make up the teaching unit to be presented is basic to successful teaching. If this concept is kept in mind, it will then become imperative that such an analysis be made before the steps of teaching procedure are determined upon.

Let us assume that a basic demonstration on the use of the marking gauge is planned for a ninth-grade woodworking class. Obviously the teacher will expect to present in proper order all the necessary tool operations as well as a logical order of facts that must be kept in mind when learning these operations and in applying them. But before he can list the instructional procedure for his lesson, he must have determined just what it is that is necessary for the learner to know and to be able to do in order to accomplish the aim of the teaching presentation. This he does by analyzing the desired procedure. The analysis may be based on experimentation by the instructor previous to the presentation, on available analyses made by others as presented in printed material, or, when the teacher has had extensive craft and teaching experience, from memory and mental analysis. The source used is not important provided the analysis is reliable so that important units are not omitted, with consequent embarrassment to the instructor. Procedures in analyzing industrial and craft processes for teaching material are discussed more fully in Chapter XIII, under the heading of courses of study.

Not only is it essential to have an analysis of operations and facts pertinent to the presentation, but these must also be arranged in instructional order before they can be presented

effectively to the class. As an illustration of the type of analysis discussed here, the following list is presented as containing the things that the learner must know and be able to do in order to use a marking gauge correctly. These are arranged also in the proper instructional order.

Analysis of Instructional Material for Lesson on Use of Marking Gauge:

1. What a marking gauge is, and its functions.
2. Identifying functional parts of a marking gauge.
3. Reading a rule up to $\frac{1}{16}''$ divisions.
4. Setting the marking gauge to dimensions.
5. Checking the set-up for accuracy.
6. Method of holding stock while gauging.
7. Method of holding marking gauge while marking with grain of wood.
8. Method of holding gauge when marking across grain of wood.
9. Sequence of operations when marking various members or parts of a construction job.
10. Reinforcing gauge lines with lead pencil.

It will be noticed that his analysis makes no reference to techniques or to actual procedures for carrying out the elements of learning which are indicated. Making the student acquainted with the best way of acquiring the desired knowledge and the ability to use the marking gauge is then covered under "teaching procedure" in the lesson plan. The analysis as shown here may be included as a section in the teaching plan. It can more properly be left out of the actual plan, however, in the interest of simplicity, and made separately for reference when the teaching plan is organized.

Approved Steps in Teaching

Plans for giving instruction in any unit in shopwork will

normally be based upon the following four recognized steps in teaching:

1. Introduction.
2. Presentation.
3. Application and assignment.
4. Checking and testing.

These steps are largely self-explanatory. Step 1 refers to the necessity of interesting the learner in the new material which is to be presented and to assist him to establish connections between his previous experience and the projected new experience. Reduced to its simplest terms, this means that the teacher must be skillful and resourceful in making the new topic or activity appear necessary and valuable before proceeding to present it in detail. Eagerness to learn should be the normal result of a suitable introduction.

Step 2 embodies the actual teaching procedure in minute detail. Whether a demonstration of tool processes or a topic for discussion is involved the fact will remain that this part requires most careful planning. The content under this step comes from the analysis of content previously discussed, but, of course, the technique of presentation must be organized and suited to individual needs.

The interpretation of step 3 for teaching in the industrial arts would be that the student is given a chance to make application of the new learning at the earliest possible moment. He should have opportunity to practice what has been presented in order that the material presented may become a part of his own experience.

The practice of testing and checking as indicated in step 4 must be a definite part of every teacher's activity. This step is not satisfied simply by giving examinations at infrequent intervals. It means constant follow-up of every lesson or presentation or assignment to see whether the learners have attained the desired goal.

A Sample Teaching Plan

While the four steps in teaching discussed in previous paragraphs form the basis for the teaching plan, it becomes necessary to add other items as preliminary matter when writing the plans. Some of these items may vary according to individual circumstances. They would normally include: (1) name of school, (2) name of supervisor or supervising teacher, (3) grade of students, (4) subject taught, (5) name of the teacher writing the plans, and (6) date when lesson will be presented.

Even more necessary than these would be: (1) a statement of immediate objectives or goals sought by the lesson or presentation, and (2) a listing of tools, materials, and other teaching aids to be used. The following sample teaching plan will indicate the organization of material according to these procedures:

TEACHING PLAN IN SHOPWORK

School: University High School   *Teacher:* ....

Grade: 9B   *Supervisor:* ....

Course: Woodwork   *Date to be Used:* ....

I. *Objective:* To enable students to learn correct use of the marking gauge and to acquire practice in manipulating it.

II. *Tools and material used:*

1. Standard marking gauge for woodworking.
2. Chart showing disassembled gauge and names of parts.
3. Chart showing various types of gauges and their development.
4. Piece of stock for practicing.
5. Working drawing of footstool.
6. Legs and rails of footstool ready for laying out mortise and tenon.
7. Rule.

8. Try square.
9. Pencil.

III. *Preparation (developing proper mind-set in learner):*

1. The marking gauge is one of the tools most commonly found in the tool kit of all woodworkers. Is one of the oldest tools used.
2. Historically, it has passed through various stages of development as shown by charts available.
3. The value of the marking gauge is that it furnishes an accurate method of making lines on wood parallel to the edges of the stock. It makes it possible to mark for thickness, width, etc., much more accurately than with rule and straightedge and more rapidly.
4. The marking gauge is not so easy to handle, however, as it might seem to be when a skilled workman uses it. For this reason it is advisable to observe the procedure carefully and then practice on waste stock until the necessary skill has been acquired.
5. Many different kinds of gauges are used in trades and industries, such as thickness gauges, wire gauges, depth gauges, etc.

IV. *Presentation (procedure in teaching):*

(This lesson is taught by the demonstration method.)

1. The functional parts of a marking gauge are head, beam (marked in inches and fractions), thumbscrew, and spur, as shown on chart available.
2. The head is movable on the beam and is fastened at any desired position by the use of the thumbscrew.
3. To set the gauge, move the head to the dimension desired, according to the markings on beam, and tighten the thumbscrew.
4. Now check the accuracy of the set-up by measuring with the rule the distance between spur and beam. This is necessary because the spur may be bent from its original position.
5. A more accurate check may be had by testing the gauge on a piece of scrap stock and measuring with the rule upon the stock.

6. When in use, the gauge is held in the right hand with the head in the palm of the hand as if holding a ball or similar object. The thumb is extended along the beam (as shown by the instructor).
7. The stock is held in the left hand, with one end usually resting against the bench stop or bench hook.
8. Always have stock face marked and run the head of the gauge against the face of the stock.
9. Relax the muscles of the right hand in order to feel the gauge running flat against the stock the whole length of the stroke.
10. The stroke is made away from the operator.
11. It is advisable for the beginner to make a light line with the first stroke and to reinforce it with an additional stroke or two.
12. The line made by the marking gauge may be made more visible by running a sharp pencil along the groove made by the spur.
13. When marking several members of a project such as mortise-and-tenon joints for doors and frames, be sure to mark all pieces before resetting the gauge.
14. Care must be taken not to bend the spur of the gauge, causing the gauge to become inaccurate.

V. *Application and assignment (learner applies new instruction as assigned):*

1. Instructor asks appropriate questions to make sure that learners understand presentation and know how to apply it to new task.
2. Instructor points out direct application of presentation to immediate learning needs of students.
3. Students will practice gauging on scrap stocks until technique is established.
4. Students will proceed to gauge legs for footstool to required dimensions under close supervision of teacher.
5. Individual assistance is given wherever needed.

VI. *Checking and testing:*

1. Each student will present practice gauging on scrap

stock for approval before proceeding with actual work.
2. Instructor will check marking on actual work before student planes the legs to size.
3. General difficulties will be reviewed in subsequent lesson, or if too serious, the class is called together again for discussion and further explanations.
4. Students may be given the responsibility for checking their own and their fellow students' work.

This teaching plan can be used equally well with any one of the teaching methods discussed earlier in this chapter. Part IV of the sample plan, containing *Presentation*, is of course adjusted to the type of procedure or technique employed. If instruction sheets, or book instruction, furnish the main body of information or direction, it will be so indicated in making the plan. If a purely informational lesson is to be presented, the facts that are to be taught will be listed under Part IV and the *Application* will be organized accordingly.

The Abbreviated Teaching Plan

While it would, no doubt, be of benefit to teachers of experience to write out a comprehensive plan periodically in order to check their own ability to analyze and organize their work in complete detail, it is obvious that to continue to make such a plan for every lesson or meeting with the class would cause an undue drain on the instructor's time. It should be kept in mind, however, that there must be some form of organized procedure thought out before the work is to be presented, and this procedure should be based upon the needs as established through an analysis of the instruction unit. As has been suggested previously, after much practice the instructor becomes able by habit to keep much of this in mind and do much of the recalling and organizing in the presence of students.

It is also true, on the other hand, that teachers become ha-

bitually careless about the efficiency of their teaching, and, in such cases, the plan is omitted not because it is superfluous but because the instructor has grown stale on the job. Supervisors and principals often require plans of some sort; but, whether or not such plans are compulsory, the wide-awake teacher will consider it good professional practice to plan his work with regularity and definiteness.

An abbreviated form of plan which may reasonably be used by all teachers is given below:

ABBREVIATED TEACHING PLAN

Grade: 9B *Date used*

Course: Woodwork

I. *Topic to be covered: the use of the marking gauge.*

II. *Tools and materials needed:*
1. Marking gauge.
2. Charts.
3. Practice stock.
4. Legs and rails of footstool.
5. Working drawing of footstool.
6. Rule.
7. Try square.
8. Pencil.

III. *Preparation:*
1. Importance of marking gauge in woodworking.
2. Historic development of gauge.
3. Skill needed for using gauge.

IV. *Presentation (demonstration by teacher):*
1. Names of principal parts of gauge.
2. Operating thumbscrew.
3. Methods of checking for accuracy.
4. Holding stock.
5. Holding gauge.

6. Reinforcing line with pencil.
7. Care of gauge.

V. *Application and assignment (student work):*
1. List of questions to check understanding and indicate application to real job.
2. Learner will set gauge to ½″ and make line on practice piece.
3. Do the same for ⅝″, ¾″, and 1½″.
4. Learners will gauge legs of footstool to size.

VI. *Testing:*
1. Check gauging on practice piece.
2. Check set-up on gauge before student marks finished work.
3. Students will check work of other students.
4. Names of parts of gauge will be checked in written test with other tools included.

The use of a plan of this kind does not demand a large amount of time in writing. The benefits will far outweigh the effort put forth. If such plans are filed by the instructor, they become equally useful when the work is repeated. They also furnish an opportunity for checking results of the teaching, in addition to being available at any time as an evidence to the principal or supervisor of teaching efficiency.

Basic Units Covered by Teaching Plan

In shopwork the scope of teaching plans may be determined by one of several considerations:

1. *The unit plan.* This type of plan is based upon an instructional unit, which again may consist of: (a) a unit operation or principle involved, or (b) a detail of construction of an article. The plans submitted here cover one instructional unit. This unit again is distinguishable as an operation. If the objective had been "to lay out mortise and tenon for a foot-

stool," then the unit would have been determined as a detail of construction.

2. *The project plan.* This type of plan may cover the work of several meetings of the class and several demonstrations or lessons. It is based upon the complete article to be constructed or the job to be done. In general it is difficult to plan the teaching in this way. The course of study should describe the entire block of instruction. The teaching plan will treat the work in smaller units. Where pupil planning and use of instruction sheets are stressed, however, it is sometimes necessary to make plans covering a larger scope of activity by the teacher and students.

3. *The daily plan.* This plan is organized with reference to the scope of work which is to be covered in one day or one teaching period. It is difficult to use in shopwork, because one cannot foresee with accuracy how much work can be accomplished.

4. *The weekly plan.* Here, again, the time element enters and makes planning uncertain. The weekly plan is, however, more workable than the daily plan, because it is extended over a longer period of time.

The Weekly Report or Checking Sheet

Whether the teacher is working directly under a supervisor or not, it is a good practice to use some means of checking at regular intervals upon the success in teaching the material outlined in the teaching plans. A more complete treatment of evaluating teaching efficiency appears in Chapter IX. It seems, however, that some type of checking and report sheet is a distinct complement to the teaching plan, and for this reason it is mentioned here. A form for this purpose which has been used with apparent success by student teachers under the author's supervision is furnished in this connection:

WEEKLY CHECKING SHEET

Teaching Report for week ending..............................

Assignment: School ....Teacher ....Grade ....

Days ....Hours ....

Course ....Attendance ....Supervisor ....

Project or Projects Under Construction: ....

Specific Information Topics Presented:

1. ....
2. ....

Demonstrations Given (group or individual):

1. ....
2. ....
3. ....

Apparent Success of Demonstrations Given:

1. ....
2. ....
3. ....

Special Problems Met:

1. ....
2. ....

How solved:

a. ....

b. ....

Problems unsolved:

a. ....

b. ....

Original Ideas and Suggestions for Better Progress:

1. ....
2. ....

Criticisms Received:

1. ....
2. ....

Name of Teacher: ....

Remarks by Supervisor:

....

....

This form, with slight variations, should be useful as a weekly checking sheet by teachers on the job. Other forms can easily be organized to suit individual conditions. Unless frequent check is made upon one's teaching, and unless time is taken to look back and evaluate one's progress as compared to original plans, there is likely to be lack of correlation between what was intended and what has actually been accomplished.

Avoiding Annoyances and Distractions

A number of suggestions were offered in Chapter I for developing an initial interest in the work at the beginning of the course or the school year. It is probably easier, however, to establish an attitude of enthusiasm than to maintain it.

Unfortunately, the average school has not yet recognized the student as the center of the school program. In theory, all would agree that the school is organized for the students; in practice, evidence would refute the theory to a great extent. By carelessness, more than by design on the part of teachers and administration, the student is often annoyed, interrupted, discouraged, and otherwise treated as if his time and effort were of no real consequence. Too many of these annoyances are allowed to exist in the industrial arts shop. Some of them may be unavoidable, but, in most cases, lack of planning and lack of understanding of adolescent psychology are causes of their existence. The following list will indicate some of the more obvious annoyances and distractions that tend to kill interest and retard learning in school shops.

Distractions and Annoyances:

1. Dull tools.
2. Waiting for instruction.

3. Inadequate demonstrations.
4. Waiting for slow students.
5. Tools not available.
6. Materials not available.
7. Beginning and advanced students mixed.
8. Too much lecturing.
9. Too long demonstrations.
10. Lack of work stations for all students.
11. Too large classes.
12. Too much theory and bookwork.
13. Loafing by some students.
14. Teacher lacking mechanical skill.
15. Lack of definite instructions.
16. Interruptions by assemblies.
17. Too many school projects.
18. Instructor working on personal projects.
19. Poorly arranged shop.
20. Poor light.
21. Outside noises and distractions; playgrounds, etc.
22. Work projects prove too difficult.
23. Teacher has "pets."
24. Maintenance men working in shop.
25. Too much related and technical information.
26. Projects obsolete.
27. Too much repetition of information and toolwork.
28. Teacher leaves classroom over long periods.
29. Instruction interrupted by phone calls or by the administration.
30. Teacher's mannerisms.
31. Too many rules.
32. Too much student participation in management.
33. Students called out by teachers and administration.
34. Tool man interfering with student activity.
35. Lack of locker space.

36. Class time too short.
37. Problem students in class.
38. Too much tool maintenance.
39. Building too much shop equipment.
40. Too much practice work.
41. Power equipment in poor condition.

Remedies for most of these annoyances are obvious to wide-awake teachers. Good teachers will not let many of these conditions develop to a noticeable degree, and they will quickly recognize and proceed to eliminate those that may exist or threaten to appear. Some of them may be outside of immediate possibilities for action, and the best thing the teacher can do is to counteract them in the best way possible and wait for future opportunities to act.

Techniques for Maintaining Interest

The following suggestions are offered for maintaining interest and keeping it at a high pitch over a long period of time:

1. Call class together at the beginning of each period.
2. Have a definitely planned, small unit of instruction ready for presentation for each class meeting before students go to work.
3. Make each presentation different from that of the day before. This can be brought about by differences in subject matter or in manner of presentation.
4. Use variety of teaching aids both for instruction and for stimulating interest. (See Chapter V for a discussion on teaching aids.)
5. Draw upon popular magazines, motion pictures, newspapers, etc., for examples of applications to work which students are doing.
6. Rotate student jobs in class maintenance at frequent intervals.

7. Indicate or present difficult, but interesting, problems for solution by class, encouraging problem solving.
8. Use blackboard sketches for stimulating interest.
9. Give recognition to student effort. Do so often.
10. Keep a progress chart. Students like to see their degree of progress indicated by marks.
11. Let students assist in solving problems rather than simply be told what to do.
12. Assign work so that each student can experience success.
13. Keep an atmosphere of joy and accomplishment in the class at all times.
14. Make the work of the class progress at as rapid rate as possible.
15. Use questions freely to stimulate thinking and sustain interest.

PROBLEMS AND QUESTIONS

1. What additions would you make to the thirteen factors for a successful demonstration presented in this chapter?
2. Under what conditions should the teacher call upon students to make demonstrations before the class?
3. Are trade methods always feasible or desirable in the school shop? Why?
4. If a pupil begins four weeks late in a class in electrical work, is it better to start him from the beginning or to let him go with the class as far as possible?
5. Give a list of teaching units for the shop which you think can best be taught by the lecture method.
6. How could industrial-arts content be used for the "core" in the junior-high-school curriculum?
7. Discuss teaching methods other than those mentioned in this chapter.
8. Explain what is meant by the "child-centered school."
9. To what extent do you feel that "integration" may be carried out in teaching industrial arts?
10. How should one deal with the student who always wants to do things a different way from that shown in the demonstration?

11. What are the advantages and disadvantages in using students as monitors?
12. What method or methods of teaching will best promote "problem solving" and discovery on the part of the pupils?
13. In planning a lesson for a new group, what means would one have for determining what is already known?
14. For what reasons should students be allowed to make up their own procedure sheets?
15. Write a teaching plan on some unit of presentation involving the conference method. Follow the style of the comprehensive plan presented in this chapter.
16. How would you deal with a custodian or janitor who comes into your room and shows students how to do their work?
17. Discuss the relative length of class talk and discussion as compared to the time allowed for manipulative work in junior-high-school industrial arts. In senior-high-school.
18. Name five magazines in which the teacher would expect to find suggestions for industrial arts projects.
19. List ten teaching units or topics which would lend themselves to the use of the conference method.
20. How much time should a shop teacher have for preparation as compared to a teacher of mathematics?
21. What can industrial arts teachers do to impress upon principals the need of scheduled time for preparation for daily work?

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Chapter III

DISCIPLINE IN THE SCHOOL SHOP

Interpretation of Discipline

The interpretation of discipline in the schoolroom has changed materially in recent years. In contrast to the old thought of implicit obedience to rules and regulations, the modern teacher considers effective discipline to be connected with self-imposed personal and social adjustments on the part of the pupil—adjustments that will foster habits of thinking and of conduct that will lead to social responsibility both in present and future group life.

Under this interpretation of discipline, rules and regulations will lose much of their importance except as they are understood and accepted by those who are affected by them. It will also be implied that enforcement of rules will be approached from a new viewpoint, and that "reproof" and "correction" will be administered, when necessary, in the light of individual behavior, rather than of blind "punishment."

For the school shop, successful discipline of the type discussed here is largely dependent upon the following conditions: (1) interest and understanding on the part of the pupil, (2) careful planning by the instructor, and (3) suitable working conditions. These will be discussed in detail in following paragraphs.

Pupil Participation in Discipline

In a modern approach to the problem of class management and discipline in the school shop, the student must first be considered. It is a trite saying that we must not teach subject matter in our schools, but boys and girls. Yet it is true that

even in our day numerous shop teachers, probably the majority, are approaching their work from some other viewpoint than that of the student himself.

In order to have discipline we must have coöperation of the students, and coöperation is a result of an attitude of mind. The question of coöperative attitudes on the part of students was briefly discussed in Chapter I. It has such direct bearing upon the question of discipline that it can well be emphasized again.

In dealing with this question of class management and discipline from the student's angle, the following factors should receive consideration:

1. *Is the student interested?* Students who are not interested soon become a problem for the teacher. Take time now to make a plan for interesting them, and save time later in enforcing discipline. Probably without exception every class member can become interested in the work if properly encouraged.

2. *Is he definitely occupied?* "An idle brain is the Devil's workshop," is a statement that applies here. Idle brains and idle hands are closely associated. The instructor's responsibility is to plan work for everyone—work that is educative and interesting. The rapid worker often becomes a problem here. With his work completed, and nothing more planned until tomorrow, what is there to do but some kind of mischief or useless activity for the rest of the day?

3. *Does the boy appreciate time values?* One of the most difficult things of all in dealing with young, inexperienced persons is to develop in them an appreciation of the value of time. Wasting time appears to be the principal occupation of some students, and where there are loafers present the question of order and discipline soon becomes acute.

4. *Does he take pride in his work?* Some cases in discipline probably arise from the fact that the student has no pride in

his own accomplishments. In many cases he has never accomplished anything praiseworthy, and, consequently, has not experienced the joy of success. Make his work successful by all means, in some accomplishment well within his ability, and be sure to give recognition to even the smallest degree of success. Habitual failure in work makes a student quit trying and begin to play.

5. *Does the student know what is required?* Frequently, instructors mistake lack of knowledge of requirements for ill will and lack of coöperation. It is the duty of the teacher to give out definite information regarding shop practices, detailed procedures in carrying out work, standards of workmanship, care of equipment, and other requirements of the shop program.

6. *Does the student have a purpose?* Upon the answer to this question depends many so-called problem cases. Lack of a purpose in the student's mind is the cause of lack of interest in the shop as well as in English or Latin. A method of acquainting pupils with values to be gained has been discussed in Chapter I.

7. *Does he think well of the teacher?* Once the author heard a school superintendent say that the greatest success quality of the part of an elementary teacher is to be able to be well liked and respected by her pupils. This statement deserves consideration by teachers of all grades. Some teachers complain that students do not have the proper respect toward them. The reply might well be that there is just as much respect as has been instilled by the instructor. There is a difference between familiarity, on one hand, and friendliness and frank dealing on the other. Aloofness on the part of the instructor for the purpose of preserving dignity is probably as bad as a total absence of reserve. After all, the teacher must be "looked up to" by those in his charge. Some teachers can go further than others in meeting the students on an equal

basis, but a certain amount of reserve seems to be essential for successful discipline.

8. *Does the student have aptitude?* Total lack of aptitude for the work is a cause of lack of interest in it. In extreme cases of ineptness, might it not be better to substitute other types of work, or change the routine in the manipulative work, rather than to run the risk of developing undesirable habits and personality traits? At any rate, lack of aptitude should be recognized when dealing with discipline in the shop.

9. *Is he socially adjusted to the group?* Difference in age, failure in other school subjects, being out of tune with the group socially, economic status, and similar conditions typical of adolescence must be understood by the teacher when dealing with problems of discipline and class routine. In respect to these problems the industrial arts teacher has superior opportunities to assist students because of the informal atmosphere that may be maintained and the close personal contacts possible.

10. *Is he properly dressed for work?* When not properly dressed for work, the student is at a disadvantage at the outset. Such a condition makes him exempt from certain phases of the work, and soon places him in the position of a privileged or superfluous character.

The Teacher as a Factor in Discipline

The teacher and his attitudes have great bearing upon the responses that students will give. Too often it is felt that students are inferior in ability or irregular in their behavior when in reality the instructor has failed to do his part. The questions which are directed toward the instructor in the following paragraphs may throw some light upon his duties and possibilities as a factor in discipline.

1. *Is the teacher interested in teaching?* It is obvious that interest on the part of the teacher stimulates pupil interest.

Teachers whose hearts are not in the work, who have no real love for the youth under their care, and who may be in the teaching profession as a temporary measure only, will soon be found out by their pupils. A disinterested teacher will soon have disinterested pupils.

2. *Is he interested in the subject which he teaches?* A teacher may be effective in certain subjects where his interest is strong, and not so effective in some other subject. Interest in the subject matter can be developed if one is interested in teaching generally. Sometimes teachers are requested or required to teach new subjects when they have no particular interest in such subjects. Unless the person soon develops an interest in such work, the condition will have bad effects on the students.

3. *Does the teacher know his subject matter?* This question needs no elaboration. Many a teacher has lost the hold on his class because of the one fact that he has not had sufficient knowledge and teaching skill in the subject. Lack of respect develops from lack of confidence in the instructor. If the instructor lacks knowledge or skill for efficient teaching, he should improve himself without delay or quit his profession.

4. *Does he have aptitude for teaching?* There are "square pegs in round holes" among shop teachers. The teacher without aptitude has many troubles with reference to discipline. The best he can do is to go into some other occupation or look toward teaching some other subject.

5. *Does he speak plainly and convincingly?* The speech of a teacher is either his asset or his liability. Extensive self-improvement can be brought about on this point. The manner in which directions are given and the subtle effect of the voice of the instructor are of great importance. From lack of perfection in this regard come many difficulties in discipline.

6. *Can he control his emotions?* It may seem strange to question a teacher on this point. But the question is pertinent.

No one who lacks the ability to control himself can expect to be successful in directing and controlling others. One display of lack of control of his temper will put the teacher at a disadvantage with his class. Whatever else a teacher may lack he must of necessity have the ability to be calm and sensible at all times.

7. *Has he a sense of fairness?* Lack of ability or inclination to be fair may be unthinkable by some in connection with the attributes of a teacher. Yet every instructor is human, and, unless he checks his own attitudes and procedures closely and often, there may creep into his reactions some dealings which students will justly consider unfair. Also, there are teachers who seem to lack the natural qualities of leadership and personality that enable them to make just decisions quickly and acceptably to students. What has been said here should not be confused with the tendency of students to have a temporary feeling that they have gotten a "wrong deal." If the instructor is just at heart, and reasonably tactful in his contact with students, such feeling will in the long run be replaced by one of respect and admiration.

8. *Are learning difficulties appreciated?* Discipline problems sometimes are created by lack of sympathy with the pupil in the early stages of his learning. Teachers are prone to forget the difficulties which they experienced in learning those processes of thought and performance which have now become habitual with them. The more expert the teacher is as a mechanic, the more danger is there that he will underestimate and sometimes ridicule important problems of beginning students. Such an attitude on the part of the teacher leads to difficulties because of the fact that young persons—and older ones as well—will lose interest when that which is expected of them is far beyond what they are able to produce. The almost inevitable outcome of such a condition is that that student gives up trying and becomes accustomed to failure.

9. *Does the instructor support the administration?* Apparent loyalty toward the administration is necessary at all times if the morale of the students is to be right. Lukewarmness toward policies of the school, or, what is worse, adverse suggestions to students, have no place in the teaching profession. If the instructor himself cannot be loyal and coöperative, how can he expect to receive the loyalty and coöperation needed for effective work and good discipline? If a faculty member wishes to criticize his superior or employer, he should go directly to the person concerned.

Working Conditions Affecting Discipline

Equal in importance to the pupil and the teacher in the matter of student reaction and conduct stands the question of the physical conditions under which students work. For it has been proved that interest in the work is closely correlated with conditions under which one works. This is true in industry and schools as well; perhaps even more so in schools, because of the lack of other compulsory factors possessed by industry. Consider the following questions in this connection:

1. *Does each student have an assigned work station?* Students not knowing where they belong cannot be expected to go to work in a regular manner and attend to their work. Continued interest cannot thus be maintained, and the play spirit will begin to manifest itself. This does not mean that under some shop conditions such working places may not be reassigned often, but the student must know exactly where he is expected to be, and that he will not be interfered with while doing his work.

2. *Is there sufficient space between benches or work stations?* Lack of space for doing work, and too close contact with other students, causes distractions that lead to broken morale and weak class organization. However strict the rules

may be against play in the shop, it is likely to manifest itself when students are placed in too close proximity to one another during the working period.

3. *Is there adequate light?* Working in poor light may help to make a discipline case out of any type of student. Unconsciously, perhaps, comes the spirit of rebellion which may show itself in an infinite number of ways. Light conditions for students may be improved in many ways, among which are adding skylights, by putting in prism glass for diverting light, by installing proper artificial light, by interior painting, and, last but not least, by moving and changing workbenches so that the light falls in the proper way and from the proper angle.

4. *Are machines and common equipment well located?* The location of machines for routing work, or for supervising instructional units, has an important bearing on this problem. Lack of success due to lack of accessibility of equipment is a forerunner to lack of interest, and lack of interest again leads to a substitution of something else for purposeful work.

5. *Are there special facilities for class teaching?* An assembly room where the class may be called together to sit down is a desirable feature in connection with all shops, but an absolute necessity where more than one class is at work in one room. An orderly demonstration with proper attention can hardly be given in a shop where a large number of other students are at work. There should be facilities for instruction if students are expected to profit by the work and pay attention to it.

6. *Are there adequate locker facilities?* A place where the student can keep his unfinished work is a valuable factor in student morale. To lose work upon which hours of patient effort have been expended leads to discouragement and dissatisfaction.

7. *What is the condition of the equipment?* Tools which

do not serve their purpose and machines which will not run definitely cause weakening of student morale. Respect for equipment is a factor in securing proper behavior in the shop that ranks in equal importance with the respect for the teacher. Probably one should go one step further, and list it as a prerequisite for the proper respect for the instructor, for unless the instructor is able to maintain the equipment in good shape he will very likely not hold the students' respect.

8. *Is there order in the toolroom?* The condition prevailing in the toolroom is the key to the condition of the entire shop. The way in which tools are handled here, the system of checking tools, the language and manners allowed and practiced, can easily be taken as a sample of the tone of the entire shop. No orderly shop can have a disorderly toolroom. The location of the toolroom also has bearing upon this topic. An out-of-the-way toolroom causes waste of time, and offers temptation to loaf.

9. *Is there ample ventilation?* Every experienced teacher knows how intimately ventilation is connected with the problem of attention and concentration upon the work. In the shop, where the working temperature should be lower than in the regular classroom, there is no reason for disregarding proper ventilation.

10. *Is cleanliness practiced?* This question can well be asked with reference to washrooms, toilets, shop floors, tools and machines, and the clothing of instructor and students. Incidentally, it may be said that the proper shop clothing goes a long way to establish the spirit of labor and "busyness."

11. *Is there a shop atmosphere?* The spirit of mischief, or of play, or of loafing, has a hard time surviving in a shop that is saturated with the atmosphere of a real workshop. Once the atmosphere of earnest endeavor has been established, the discipline problems have been diminished or have disappeared.

An organization in which everyone has a job to do and is doing that job, where no one has time to think of breaking rules and where there are few to break, where industry and effort are apparent on every hand—in such a shop there need be little time devoted to catching up with offenders.

Good Discipline a By-Product

The foregoing discussion points to the conclusion that good discipline is an outcome of proper organization, and is a by-product rather than an objective. Teachers who must spend their time constantly in securing and maintaining discipline are wasting much of the time spent. It is better to spend the time in preparation for interesting and profitable activities, and let proper conduct and discipline come of its own accord.

Elements of Good Discipline

Little has been said about specific practices in class management and details in requirements that would apply to good discipline, although reference has been made to the fact that practices vary with different teachers and different systems. The reason for not attempting here to define methods and procedure for teachers to follow is that there is no one set of rules that can be successfully used by all teachers and all students. However, the following suggestions may be helpful:

1. *Freedom is essential.* The best progress cannot be made in the shop unless the student can have the feeling that he is permitted to use initiative, to take responsibility to some extent for his own actions. Also there is a need for opportunity to observe one another's work. The concept of discipline in schools should obviously go beyond the purpose of conforming to school regulations. The ultimate purpose is, of course, a self-discipline that is a result of accepted principles of democratic living and individual adjustment. This means that the

atmosphere of the school should, in so far as possible, be similar to that of real life. And here is where the school shop has an advantage, in that it can offer the student a freedom of action and a chance to participate in group life with a more natural opportunity to react than can be offered in most other types of classrooms.

2. *Order is essential.* Freedom turned into license means classwork in chaos. Whatever else might be expected as a result of work in industrial arts, it is reasonable to suppose that some contribution should be made toward establishing habits of coöperation and orderly procedure in dealing with materials and one's fellowmen. Unless a systematic schedule is established for the conduct of each individual and followed to a reasonable degree, the students will be deprived of a fundamental training for life and work that the school shop can reasonably be expected to offer.

The criticism expressed by some principals and by academic teachers that the boys go to the shops and acquire poor habits and attitudes, in reference to manners and conduct, should be seriously considered. There should be just as definite a range of conduct permitted in the shop as anywhere else, and the fact that the type of conduct may differ does not mean that it should break down standards in the minds of students.

3. *Students should respect authority.* The most important of all requirements in discipline is that the teacher be in control. The details may vary, and it is natural that they should do so. Students will quickly adjust themselves to any reasonable type of schedule, as long as the instructor does not lose his hold upon the situation. The poor habits that may be developed will not come from the types of rules and regulations that prevail but from the reactions of the students to them. The first and most important criterion, then, for measuring effective discipline is not, for example, whether students are permitted to go to the toolroom without special permission,

or whether they are allowed to leave their workbenches, but that such system or regulations as have been set forth be carried out without exceptions.

Maintaining Good Discipline

Preparedness has previously been emphasized as an attribute of the shop teacher. Problems in discipline can best be avoided through anticipating them and making plans for their elimination. Certain details in the routine of teaching, if given close attention, will go far toward removing the seed of disciplinary troubles. Among these are the following:

1. *Start class with definite instructions.* Calling the class together for a few words of directions or even for calling the roll will settle the minds of the students upon the work at hand and readjust them physiologically from the activities of lunchtime or recess. The fact that there may not be anything new to demonstrate does not necessarily mean that no such meeting can take place. Brief suggestions can always be made that will help to keep up interest and increase efficiency in the work.

2. *Be on guard for the first five minutes of the period.* The seed of trouble is often sown before the instructor considers that the class has begun. Mark attendance, or have it marked, promptly; and let earnest work begin at the first possible moment.

3. *Check closely and frequently on students' work.* The instructor who becomes involved in the problems of one student, and spends one half or more of the period with him, will neglect other students who need help. Needing help and not getting it, some of these students will start a "show" of their own; for adolescent boys are not prone to sit quietly and wait. Interest is also lost when frequent attention and comments are not given by the instructor, whether such comments are simply approval of work accomplished or detailed instructions.

4. *Grade students' work often.* Grading of students' work is discussed in detail in Chapter VIII. To grade often and let students know their grades will increase their interest, thus helping to eliminate discipline problems. Experience has conclusively shown that the morale of a class can be greatly improved by more frequent grading, and by leaving the marks in open view.

5. *Stay in the room.* Some teachers have the habit of leaving the room during the class hours. They leave for good reasons, such as turning in requisitions, going for mail, and the like. But their absence is not without effect upon the class. The age of students and the type of work have some bearing on this point, but for all younger students the advice should most emphatically be, *stay in the room.*

6. *Limit the time for closing the period.* Too much time for putting away work and tools is as bad as too little. One should experiment to see how little time can be made to serve the purpose. By close teamwork and student coöperation, this amount of time can be reduced from the amount usually consumed. The last five minutes are of almost equal importance with the first five.

7. *Get the supervisory habit.* The habit of seeing all students and all work at one time and at all times can be acquired by the instructor. Not to allow himself to become "lost" in any problem or individual, but to be constantly conscious of the entire group, is an attribute of good teachers everywhere but most particularly in the school shop.

Advice to the Disciplinarian

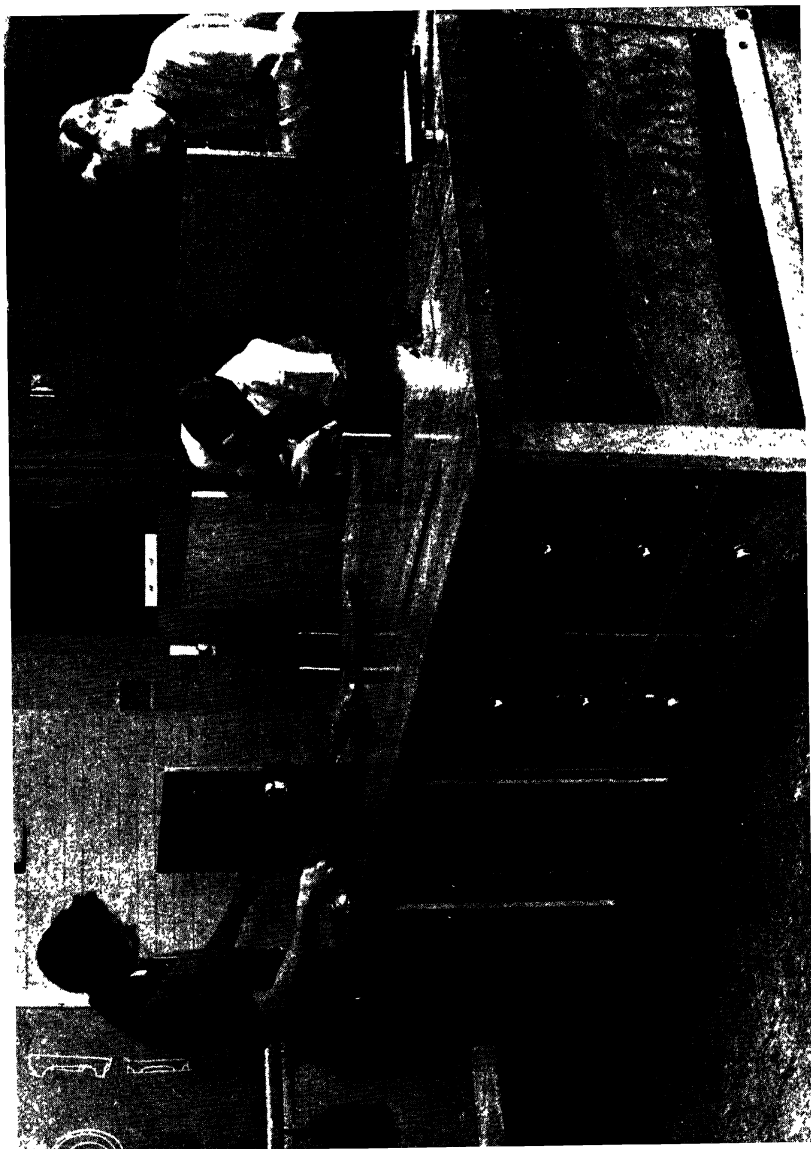
The following suggestions for effective discipline are largely as suggested by Haynes in *Teaching Shop Work,* with brief, original elaborations for each.[1] All of them may be of value for checking procedure and effectiveness in class management and discipline.

WEST HARTFORD, CONN., PUBLIC SCHOOLS

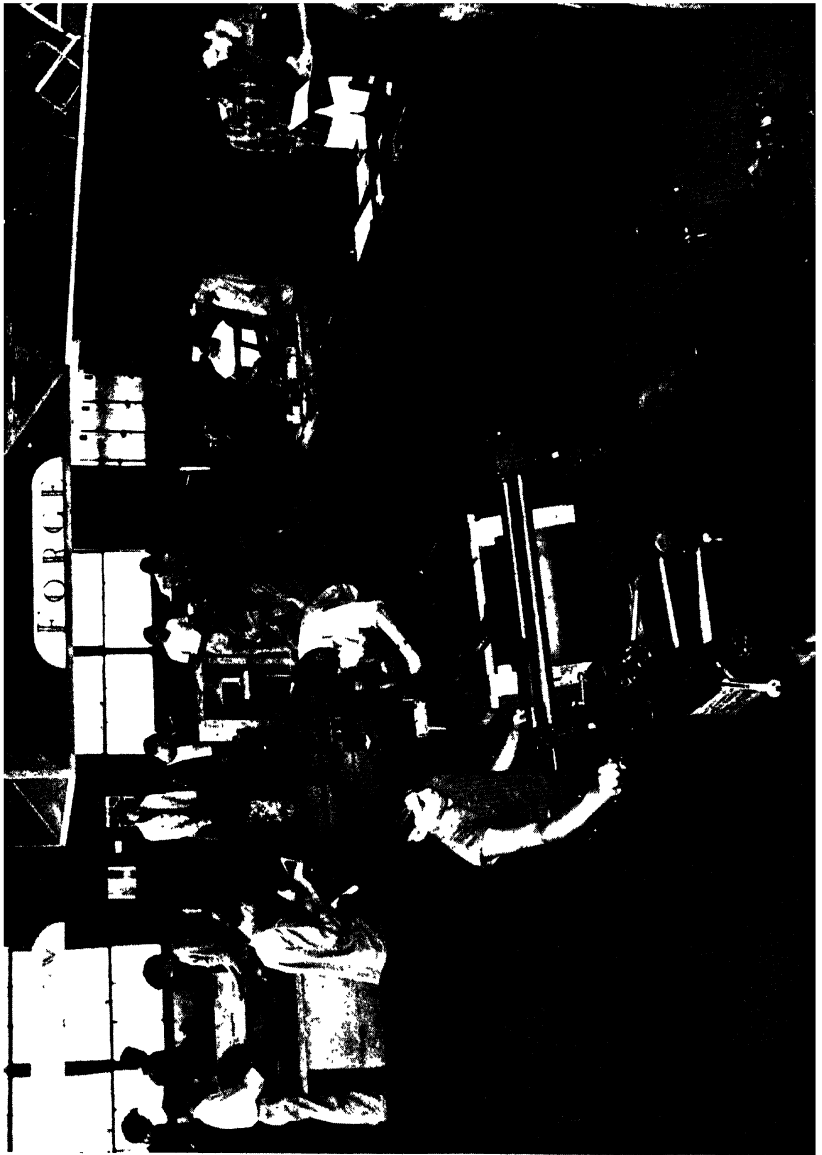
FIG. 10. Interest and joy in accomplishment will go far to eliminate discipline problems.

LOS ANGELES CITY SCHOOLS

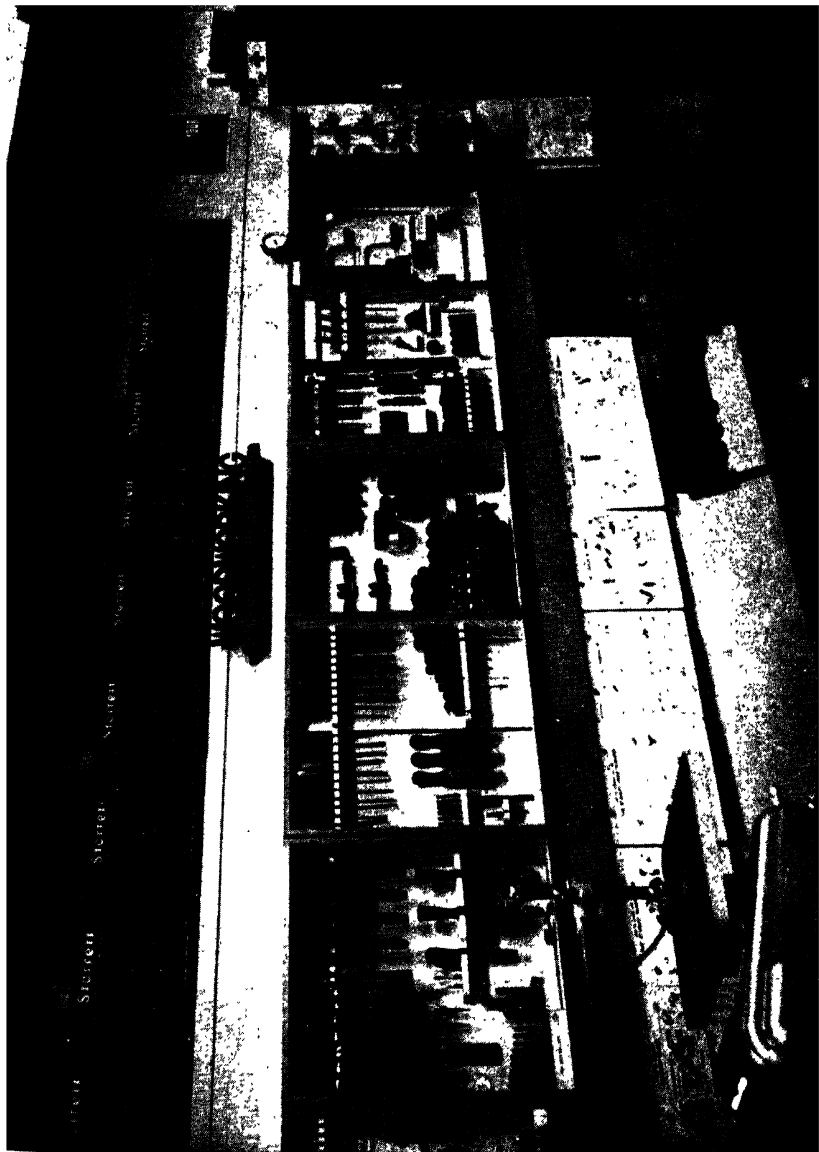
Fig. 11. Adequate work stations contribute to good student morale and opportunities for accomplishment.

HIGH SCHOOL, WESTON, OHIO

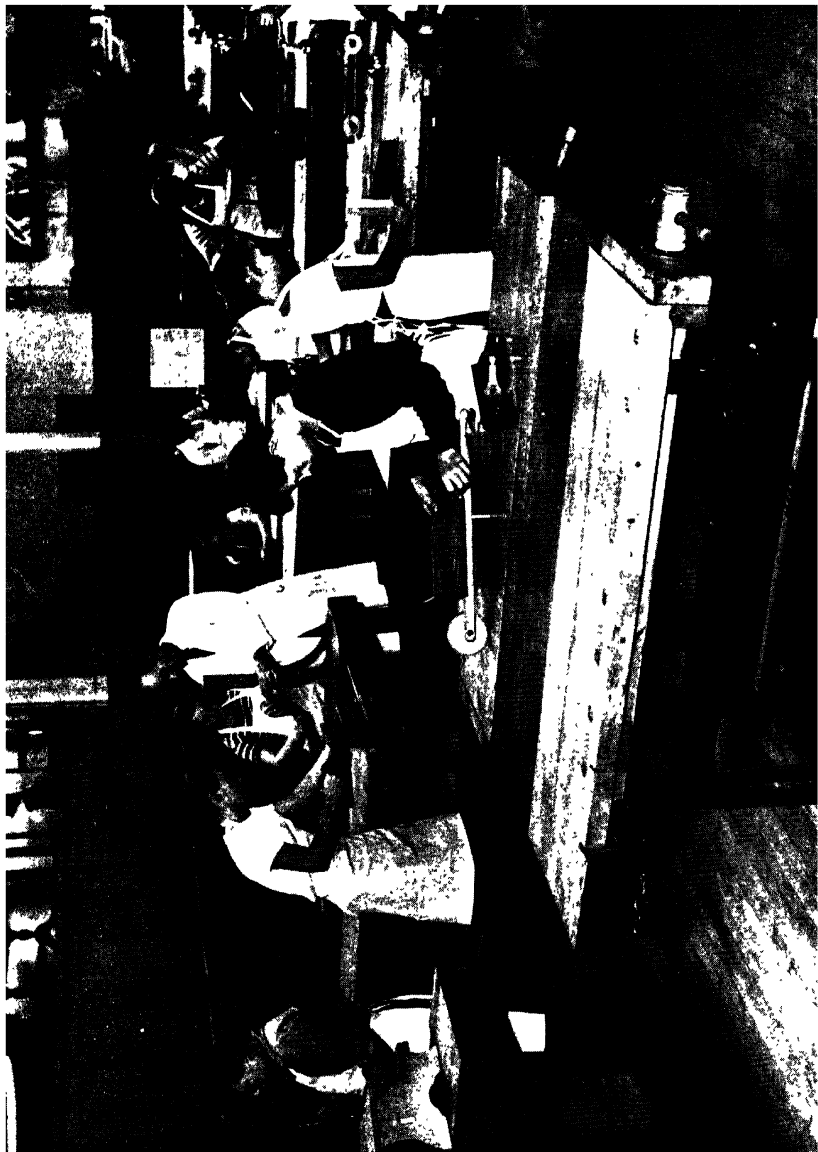
FIG. 12. The arrangement and condition of tools in a shop affect the attitude of students and their pride in doing work.

LOS ANGELES CITY SCHOOLS

FIG. 13. A clean and well-ordered shop will foster respect and orderliness among students.

1. *Do not bluff.* Bluffing is poor teaching procedure. Students are advised against it. Too many teachers engage in the practice. It may work until someone calls the bluff. But even before that, students can usually tell insincerity when they see it. It is better to admit a fault than to try to cover one up by additional errors.

2. *Do not threaten.* It furnishes too much of a challenge to learn whether you intend to put the threat into effect. It is more effective to act without warning, other than a clear explanation of rules of acceptable conduct. Some students may never have considered breaking the rules until they hear of what is going to happen to them if they do.

3. *Do not lose your temper.* Self-control is essential in a disciplined person. The teacher must have mastered it before expecting to instill it in his pupils. Brawls between students and teacher do not promote respect for the teacher's judgment and authority.

4. *Do not use sarcasm.* Sarcasm cuts deeply and leaves scars. Coöperative spirit cannot be developed by means of it. It is a good method for making enemies uselessly, the kind of enemies that are not inspiring or helpful. Of all temptations in the way of the teacher that must be overcome, that to use sarcasm is probably the most important. It is a trap into which the best instructors tend to fall, for the opportunity usually comes without warning or premeditation.

5. *Do not nag.* The teacher who is constant in adverse criticism becomes tiresome. So monotonous may nagging become that students pay very little attention to it except in making up their own mental picture of a "nagger." In correcting errors of establishing habits, "one thing at a time and that done well" is of great importance. In order to emphasize that *one thing*, the instructor must temporarily "forget" all other

[1] Haynes, Merrit, W., *Teaching Shop Work*, Ginn and Company, Unit Seven.

things. To mention several difficulties at one time is to confuse the student and probably get none or the great minority of them corrected.

6. *Make few rules and regulations.* Too many rules are worse than none. Make them few and obviously important. The more rules there are, the more exceptions will be necessary. Let coöperative spirit prevail and not many rules will be required.

7. *Do not exaggerate.* Using superlatives and magnifying ordinary errors have lost for many a teacher the respect he should have from his students. Students know fairly well what is a grave offense and what is not, regardless of exaggerations by the instructor.

8. *Do not humiliate the student.* Who is there that has not in his heart an unhealed cut, and a remembrance of bitterness against some former teacher, because of having been unnecessarily humiliated before his classmates? To accuse individual students before the entire class is a bad practice, and can lead to no beneficial results. It is better to pass the grievance by in the least noticeable way, and later deal with it on the individual basis. It must not, however, be forgotten and allowed to breed troubles later on.

9. *Do not use group punishment.* It would seldom happen that an entire class would be guilty of violations of rules of conduct. Teachers who punish the group for individuals' offenses usually create ill will and invite future difficulties. Apply the correction justly to the individual who deserves it and leave the group undisturbed.

10. *Do not be anxious for the last word.* Some teachers appear so afraid that they will not be justified before the class, or that the victim will not be sufficiently "squelched," that they continue in long arguments or lectures to make sure that they have the last word. If the teacher is just, he will be so considered by the class. Sometimes it is well to drop a matter

that has no great moment, and let the students decide in their own mind what is right.

11. *Do not review misdemeanors.* Silence about lost tools or failure to obey rules is often more effective than airing such matters before the class. So much can be said about the disappearance of one or two tools that the feeling becomes general that "everybody" is taking tools. Then, as a next step, it may become fashionable to take tools. The better way is to work upon the assumption that everyone is honest, that everyone coöperates, and, if exceptions occur, attend to them as quietly and privately as possible.

12. *Do not draw premature conclusions.* The teacher must at all times be willing to wait for evidence before making pronouncements or accusations. Circumstances and even previous records are not enough for premature conclusions. The factual approach must always be used regardless of sentiment or feeling involved.

13. *Do not emphasize dignity and self-importance.* If the teacher has dignity, it will be known. If he is truly important, the students will find it out. To call for coöperation on personal grounds, or to preach the idea of self-sacrifice of the teacher, is a mistake. Many teachers like to tell their classes how well they could do in business, what sacrifices they are making in the interest of growing youth. If that is true it should not be mentioned often; if it is not true, it should not be mentioned at all. Students know very well that if such a teacher should go into business, another (probably better) teacher would come and take his place.

14. *Take full responsibility for class management.* Do not depend upon other teachers and the principal for your contribution to the students' habits of conduct. The line of least resistance is the easiest one. Just as we too often leave good English to be taught by the teacher of that subject, so we are prone to leave the teaching of manners and social habits to

the principal, the counselor, or to the home-room advisor.

15. *Use extreme measures seldom.* A good disciplinarian seldom uses extreme measures. The less disturbance and commotion, the more effective is the class management.

16. *Maintain a sense of humor.* A sense of humor will save situations that might threaten to become serious. Laughing with the class at some minor offense may often be more effective than serious scolding, besides being better for the nervous system of the teacher.

PROBLEMS AND QUESTIONS

1. In what ways may a teacher inadvertently cause himself trouble in discipline?
2. List some problems of conduct that would necessitate your taking the pupil to the principal.
3. Make a layout of an electric shop for twenty-four students that is planned especially from the viewpoint of ease in instruction and class management.
4. Work out in detail a plan for self-government by a class of twenty-four ninth-grade students in any industrial arts class.
5. What are the advantages and disadvantages of such a plan from the standpoint of discipline?
6. Make a list of twelve rules for conduct that you think would be reasonable for a beginning, ninth-grade, industrial arts class.
7. Make a list of points for judging whether good order exists in an industrial arts shop or laboratory.
8. What are some of the ways of approach to a boy who has become a discipline case?
9. Just how might the lack of locker space for storing unfinished work affect discipline?
10. What do you think of the idea expressed that modern methods of class organization and discipline tend to eliminate respect for the teacher and for adults in general?
11. What degree of "freedom" can be given to tenth-grade students in a woodworking shop?
12. How would your procedure in class organization vary between the junior- and senior-high-school levels?

13. Should shopwork be compulsory for boys who apparently have little mechanical aptitude? Why, or why not?

14. Make a list of points and procedures that would increase respect for the instructor.

15. In what respects does the matter of proper dress in shopwork on the part of students and instructor affect student conduct?

16. Just how does frequent grading of student work lead toward good discipline?

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Chapter IV

CLASS ORGANIZATION AND SHOP MANAGEMENT

Opportunities for Student Leadership

The very nature of industrial arts work in the school program is such that it offers superior opportunities for developing qualities of individual responsibility and group leadership. It should not be assumed, however, that these qualities will be developed to a high degree without careful planning and skillful management on the part of the instructor. Students are not in position to take upon themselves more leadership responsibility than is delegated by the teacher, nor can they be expected to take the initiative in participating in class management. It thus becomes the teacher's responsibility to so organize his class that students may receive maximum benefits from assisting in problems of shop routine as well as from the individual work accomplished.

With this concept in mind, the teacher will plan for student participation in management in order to furnish experience in real-life situations similar to those found in adult occupational life and in social groups. Whether the plan saves time for the teacher becomes unimportant if it promises to develop a sense of responsibility and leadership on the part of the student.

Student Participation in Management

The degree and method of student participation will vary according to ages of students, types of work engaged in, and, probably, the ability of the teacher to plan and make the plan work. In general, adolescent boys and girls like organi-

zation and will respond readily both to a reasonable plan and to responsibilities placed upon them in carrying out such a plan.

In larger classes where the instructor may take the general position parallel to the "factory manager," the organization has been carried out extensively with a supervisor or a "foreman" appointed for each of a large number of activities, many of which are suggested by the following listing.

Roll call and personnel—Maintain attendance, coöperation, good personal attitudes, compliance with regulations.

Tools—Check tools according to system used. Might also study uses of tools and do repair.

Material—Issue materials and keep records of stocks on hand.

Production—Assist in routing work, give technical assistance, organize group work.

Planning and reference material—Maintain reference material, have charge of sample projects.

Safety—Call attention to safety rules and practices.

Ventilation—Have charge of windows, heaters, and ventilators.

Finishing room—Check condition of room at beginning and close of period.

Machinery maintenance—Oil and check machines, inspect belts, make minor repairs.

Sanitation and cleanup—Check washbasins, lockers, workbenches, and machines at end of period.

Public relations—Make contact with persons in the school who request work from school shop or who have work in progress in the shop.

Many other duties may be assigned, depending upon prevailing conditions; but these will indicate the spread of possibilities for giving practice in carrying out tasks in which the entire group is interested. Some of these jobs will usually

involve the use of more than one person, in which case a chairman of the group may be appointed.

Rotating Assignments

The procedure followed in making the appointments for the various assignments may again differ according to circumstances. Some teachers feel that nominations and elections by the class are preferable, since such a method gives practice in democratic living by the group. If a scheme of rotating these positions is followed, each student will have experience in all or practically all the assignments in due time, and it might not make a great deal of difference on what job he begins. The practice of rotation has obvious advantages because: (1) It offers experience in a variety of responsibilities; (2) it furnishes new interest each time the shift is made; and (3) students get an equal share of the more menial as well as the more responsible assignments.

The rotation system has its drawbacks, however, in that: (1) Students are not equally well fitted for the responsibilities; (2) some students may not care for places of leadership and responsibility; and (3) certain functions, such as tool checking and care of supplies, suffer from constant changes of personnel. With this feeling in mind, some teachers appoint the general foreman, the tool checker, and the materials clerk for longer periods and place other appointments on a weekly basis.

The accompanying illustration, Fig. 3, shows one of the many devices used by teachers for rotating students in shop managerial jobs.

Making Assignments Effective

A word of caution may well be expressed against the use of the idea of student participation as mere evidence of having an organization in "social living" without following up the

plan to a logical completion. If appointments are made to jobs, the teacher must see to it that there is a job to do and the appointment becomes a serious matter. Too often the class is organized at the beginning of the school term and before long the follow-up on the part of the teacher becomes ineffective, with the result that habits of negligence and indifference are cultivated rather than those of responsibility and leadership.

A definite list of responsibilities should be worked out and posted before the class, showing in detail what is expected in each job; and definite evaluations of efficiency should be given each student at prescribed intervals.

Caring for Tools

Many systems and schemes for taking care of small tools have been used by different teachers with varying degrees of success. What scheme is used is probably not so important as it is to work the scheme which has been adopted. The attitude of mind of the teacher has much to do with whether one type of organization or another will be the most successful. Generally, it is expected that the instructor conform to whatever scheme happens to be used in a system or a school. In some instances, he may be instrumental in making changes to suit his fancy, and if no other teachers are affected it is legitimate that he should be allowed to use his favorite plan. The following procedures for keeping tools are in use:

The Central Toolroom

Wherever several shops are so located that they can be served by one toolroom, the central toolroom has been used extensively. Under such an arrangement, one toolroom may serve shops for automotive work, machine-shop practice, woodwork, and others. Objections have been raised to this

scheme on the ground that the equipment becomes too complicated to be handled efficiently, and that there is a tendency to favor certain types of shops. Usually when such toolrooms are in operation an employed attendant is in charge, and has full responsibility. This chief tool clerk may be assisted by students. But paid tool clerks add to the per-capita cost, and, for small schools particularly, some other plan becomes necessary.

The Individual Toolroom

A separate toolroom for each shop is a quite common arrangement. The individual toolroom is preferred by many teachers because: (1) Responsibility for its condition is fixed upon each individual instructor; (2) it is easier to place responsibility for lost tools, because fewer students are using the equipment; (3) pride in proper condition of tools and toolroom is more easily maintained—woodworking students caring little for metalworking tools, and vice versa; (4) less opportunity is offered for using tools for wrong purposes, such as checking out machinist's calipers for the wood-turning lathe and the like.

Student Tool Clerks

In the individual toolroom the tools are usually handled by a student tool clerk, who is a member of the class and serves in the toolroom for a brief period, after which he is relieved by another member. If, for instance, there are twenty weeks in a semester, and twenty students are enrolled, each student will be assigned one week in the toolroom, and the work will be planned for nineteen weeks of actual shopwork.

The tool clerk spends the entire time in the toolroom, and checks in and out all tools required by the class. But since this does not usually occupy the full time of the student, the

problem of how to supplement his activities always presents itself. To take the opportunity to become better familiar with the tools which he is handling, or which may be in reserve, seems to be a legitimate, supplemental activity.

Responsibility for checking broken tools and ordering repair parts will give valuable training that may be useful in later life. Forms for keeping a perpetual inventory of tools and their condition should be furnished. If such information is kept up to date, the teacher should have a much lighter task at the time for taking inventories. Sharpening edged tools, filing saws, and other similar duties would be highly justifiable activities for the tool clerk's spare time.

If the instructor will plan for the types of work mentioned, there will be little danger of lack of interest or of activity for the week the student will spend in the toolroom. To have the tool clerk attempt to carry on his shopwork either in the toolroom or outside, as some teachers do, is likely to result in irregularity in the service and lack of attention to it. Who knows but that the week's work in the toolroom may be more valuable to him than any other week in the shop when interpreted in terms of possible future application?

Procedures in Checking Tools

Various means for keeping a complete check on tools may be used. Some prefer to have students write on a paper the name of the tool they wish to obtain. This may help them learn the correct name of the tool and how to spell that name. But it is wasteful of time, and tends to diminish interest because the student is interested in doing his job.

A better way, in some respects at least, is the practice of using checks made of metal, or metal-bound, paper tags. A certain number, usually ten, of these, stamped or numbered with identifying numbers to correspond, perhaps, with the

student's workbench and locker are assigned to each student. The ten checks may be given to the student for a certain deposit covering their cost, or they may be kept on a rack in the toolroom. If the student carries the checks, he simply presents one of them at the tool window as he calls for the desired tool. Somewhere in the vicinity of the location of the tool there is a hook upon which the check is placed when the tool is removed. When the tool is returned, it is up to the student to see to it that his check is removed and returned to him.

If the checks are kept in the toolroom—which in some ways is less confusing since it eliminates loss of checks—the tool clerk simply moves the check from the rack to the tool as the student gives his check number and calls for the tool, and returns the check to its location when the tool is returned. This method is subject to the objection that it is too easy for the tool clerk to forget to return the checks, and thus a student may eventually be held responsible for tools that he once returned and that have been called for by someone else. In spite of this objection it is probably the easiest and most satisfactory method to handle, particularly with younger students.

Disadvantages of the Toolroom

Various objections have been raised by teachers to the toolroom, and also to the practice of using a tool clerk, whether paid or otherwise. Some of these are:

1. The toolroom is usually so arranged that many tools are not visible; hence the instructor cannot readily check up on the tool clerk, and the tool clerk cannot check on his predecessor.

2. If a paid toolroom man is used, it is hard to find one who has appreciation of school conditions or who is honest or energetic enough to keep the room in good condition. The

instructors lose the opportunity for close checking, and are relieved of individual responsibility.

3. If a student clerk is used, his responsibility to appear at his next class is greater than that to stay and locate tools. The "unwritten law" among high-school boys keeps him from telling the instructor who has missing tools even if he knows.

4. It becomes a "game" among the boys to see who can beat the system. Some of them are quite successful in spite of tool clerks.

5. Students are not generally interested in the toolroom job, and consequently do not use up extra energy in making it a success.

6. Young boys are not able, though they be interested, to keep a checking system in perfect running order.

Free Access to Tools

The scheme of locating tools for free access of students has gradually come into favor with shop teachers. This scheme is applied in at least three different ways: (1) the wall case or cabinet with doors, (2) the open wall case, and (3) the tool rack on the floor or bench.

The tool case with doors is simply another form of toolroom, with the difference that when it is opened all the tools are exposed to view and easily checked. While it is possible to have a tool clerk for this case, and it is sometimes done, it is customary to apply the honor system and to allow each student to remove and replace the tools as needed. It is quite feasible to let students have a set of checks for the purpose of checking out their own tools. In this way it can be determined at all times who is using the tools which are removed, provided, of course, that everyone is conscientious in following out the scheme.

If such a case is constructed with solid wooden doors, tools

can be fastened on the inside of these, and in this way the capacity of the case is almost doubled. Experience indicates that tools are fully as safe in a case of this kind as in a toolroom, and when the saving of floor space is considered the justification for a separate toolroom may well be questioned. See Fig. 4.

The Tool Panel

An entirely open panel, where the tools are accessible to persons in the shop at all times, has been advocated and used by some teachers. Upon this would be placed the necessary tools, with an outline of each painted on the board to emphasize its absence when removed. Students are then placed upon their honor and allowed to use the tools freely. Under the influence of some instructors this scheme has proved very effective. No one will deny that it promotes efficiency in the work. If persons aside from the instructor do not possess keys to the shop, or if it is not open in the absence of the instructor, it may be a desirable scheme. But most teachers like the idea of being able to lock the door to a toolroom or a tool case, and have no worries about tools until they open them again. See Fig. 5.

The tool rack which is made to stand in an open place on the floor is merely a variation of the open tool panel. Such a rack or stand should also be so constructed that every tool has a definite and conspicuous place. It is possible to put such a rack on rollers so that, if desirable, it can be removed into a separate room for safekeeping at least during vacation time.

The Individual Tool Kit

As a means of avoiding difficulties coming from the random use of hand tools, the individual tool kit will be found most effective. To furnish each student with a few most necessary individual tools for his own use and keeping is an ex-

cellent practice. Such sets of tools may be kept in individual drawers in workbenches, or may be fitted in pigeonholes in a case on the wall or in the toolroom. Such sets are most effective in woodwork, automotive work, and in other shops where success depends greatly upon the availability and condition of a few smaller tools. The item of cost enters in this connection wherever a number of classes come to the shop each day, and particularly where various shifts are scheduled during the week.

In woodworking it has often been a practice to arrange tools in a rack upon the bench. This kind of tool rack has lost its popularity because of the obstruction it offers to the handling of the work. It was found extremely difficult also to keep tools in their places in these racks, since they were too easily accessible to students working at other benches and were subject to the attention of the casual borrower who frequents all shops. A drawer in the desk serving all students who work at that particular location is superior to the tool rack, altho it does not give the satisfaction of the individual tool drawer or kit.

Identification of Tools

The more clearly the tools of the shop are marked for identification, the more likely they are to stay in their places. Because of this it is well not to depend upon marking with small steel numbers or letters. Using paint for marking is much more effective. A wrench with a stripe of green paint across it is not likely to be a comfortable possession outside of the shop. Such marking will also eliminate unintentional mixing of school tools with those belonging to students, in such work as auto repair or home-mechanics work. Where there are several shops in a building, different colors can be used to correspond to the different shops, which is especially advantageous in large systems.

The Honor System

The so-called honor system applied to the care of tools is favored by many teachers. When using this system in full, the students are made individually responsible for the tools they use and for their return. This scheme, to be successful, must be launched only after proper, preliminary preparation. To attempt it without first preparing the students fully, and obtaining a popular acceptance of it, would be unwise. But, if the individual members of the class are put into the frame of mind that makes them zealous in carrying it out, there is little danger of failure.

The honor system may be used in its widest sense, where all tools are accessible without apparent supervision; or it may be in a restricted form. In the latter case the most common, and particularly the larger, tools are kept within reach of everyone. The smaller tools, and those needed less often, are kept in a separate place and handed out by the instructor or some appointed student. In making the change from a strictly supervised checking system to the honor system, it might be well to adopt and put into practice a limited type of supervision for a season until a measure of success has been obtained.

Limitations of the Honor System

The honor system in caring for tools can be used with any of the types of toolrooms or cases previously discussed. It works better with wall cases and floor racks than with enclosed toolrooms, because: (1) The toolroom is usually so constructed that many tools are kept in drawers and racks, where they get out of place even with best intentions on the part of the student; (2) honor, in some people particularly, needs encouragement, and the open board furnishes such encouragement through the fact that all tools are handled in view of the entire class.

Bases for Good Housekeeping

After all, the key to the success of any system lies in the hand of the instructor. It is he who makes a success or failure of it. No system is self-sustaining for any length of time. The student tool clerk might be conscientious or he might not. If he were, he might lack ability and experience. The honor system with open access to tools has many advantages, and carries out modern thought in educational practice.

But wherever there is success in any of the methods, the instructor is the secret of it. "Eternal vigilance" on his part, and nothing short of that, will do the work. To be sure, the less obvious such vigilance is the more effective it will be. Attention to small details is the most important thing. To leave responsibilities to students whenever possible, and yet to give proper and sympathetic supervision to all activities, is the task that lies before the instructor.

Caring for Equipment

While the larger pieces of equipment cause less worry with reference to loss, a definite system is necessary for their upkeep and care. The class can be organized for definite responsibilities in this regard and these responsibilities shifted from time to time. Among the jobs that may be assigned in this way are: (1) oiling machines, (2) checking condition of machines—belt, motors, guards, and other details, (3) reconditioning equipment—filing saws, grinding knives, keeping school trucks in repair, and other similar duties, (4) cleaning tools and machines.

The closest possible supervision must be given to the oiling of machinery, even after reliable students have been appointed to the task. Experience alone will tell whether oil-holes are clogged, and if the instructor fails to give close observation the first warning sign may be a burnt bearing.

One student may well assist the instructor in the duties

listed under checking the condition of machines. This student works in the capacity of assistant manager, and spends several minutes at the close of each period checking the condition of equipment with regard to usefulness and safety. He will often see things that the instructor has overlooked, and may also be more familiar with weaknesses in certain students. If a checking system is not used for tools, a student will need to be assigned to check condition of small tools at the end of each period.

Equipment Repairs

Whether it is legitimate to expect students to assist in keeping equipment in order has been, and still is, a debated question. The teacher who believes that it is not may give the following reasons: (1) The students have come for machine shopwork, woodwork, or whatever the program may be, and it is unfair to take a part of their time for reconditioning machines; (2) it kills the interest of students if their regular activities are broken into for this type of service; (3) they are not able to do a first-class job of repair work on the equipment; (4) it takes too long to have such work done in this way, and the work of the classes is unduly delayed.

All of these arguments contain elements of truth, but against them may be put the arguments of teachers who point out that such work is quite the thing to do: (1) This type of work gives training that cannot be had in regular shopwork, and is likely to be valuable later: (2) the spirit of coöperation and willingness to step into emergency situations is one of the most valuable assets in life and vocational success; (3) some students are not particularly interested in the regular routine and would rather work on special problems; (4) there are exploratory and guidance values in this work of emergency training—it opens a vision of new fields of vocational opportunities.

Later in the chapter, an organization for taking care of emergency work and "trouble shooting" for the school is discussed in detail. If within the class the responsibility for emergency work on the equipment is divided in such a way and so organized that students may know that they are likely to be called upon during the assigned period, the objection usually raised, that time is taken up for illegitimate purposes, is obviated.

There can be no question that work on the equipment, whether repairs or new construction, has its value. When overdone, however, and used for saving money, it becomes exploitation, and cannot be tolerated under the name of education.

Cleaning the Shop

How much cleaning of the shop, if any, should be done by students? This question is variously answered. Not many teachers insist that students should do the sweeping of floors in the shops. Some still have to see it done in this way or do it themselves. There seems to be no reason for demanding that floors in shops be swept by students any more than in recitation rooms.

There is, however, some question as to where the students' responsibility leaves off and that of the janitor begins. To make the janitor responsible for cleaning the tools would be unwise even if it were possible.

The most successful arrangement seems to be to make the floor the dividing line of responsibility. The students should be expected to sweep off the workbenches; if the janitor does it, he immediately becomes responsible for small tools that may remain upon them. To clean all machines down to the floor brings no hardships on students, and such responsibility may result in some worth-while habits.

Many instructors prefer not to furnish duplicate keys for

toolrooms under any circumstances, and, consequently, they assign students to care for cleaning this room, or do certain parts of such cleaning themselves. This practice is to be recommended, since peace of mind is thus purchased, through a little extra physical labor at the most; and the assistance rendered by students is not enough to interfere with their regular routine.

Handling Supplies

In shops of the junior-high-school level the responsibility for care and handling of supplies usually falls directly upon the instructor. Exceptions to this occur in the furnishing of such small items as screws, nails, bolts, rivets, and the like. These are often kept in the toolroom, and where a tool clerk is used he might also serve the members of the class with these articles.

What has been said previously regarding watchfulness by the instructor in connection with care of tools applies to an even greater degree here. Tools are borrowed, and are to be returned. Supplies are not expected to return, and because of this fact it often happens that no account of them is taken after they are once issued. There is unnecessary waste in many school shops in the use of materials. Instructors who allow such conditions to exist are subject to criticism from two standpoints: (1) The per-capita cost, which is already high in shopwork and which must be high, is unduly increased to the point that serious questions may be raised about the justification of the subject; (2) undesirable habits are developed by the students, leading to lack of appreciation of value of materials and lack of respect for articles produced.

Use of Requisition Blanks

Students should be required to make out and present bills of material or requisitions for supplies that they wish to use.

REQUISITION FOR MATERIALS

Name of School ....

Sold to ....

Instructor .... Date ....

Amt.	Size	Material	Unit Cost	Total Cost

Total ....

Approved by ....

Received Payment ....

Fig. 17. Bill of Material for Student Use.

This should be done whether or not such materials are furnished free. Regularity in this respect is an essential factor in the proper use of materials. Written orders, containing estimated costs, also impress students with the value of materials and make them less likely to ask for additional amounts without good reasons. A simple form for this purpose may be made up as shown in Fig. 6. More detailed forms may be used for certain types of work, and special blanks are valuable for some types of shop, as for instance, the print shop. The arrangement of the form is not essential; the fact that one should be used is important.

Requisition forms should, of course, be filled out in duplicate or triplicate, depending upon the routine involved in their use.

The Supply Clerk

In larger systems where a paid tool clerk is used, the duties of such a person are often made to include the handling of supplies. In woodworking shops, particularly, these duties also may involve the cutting of stock in the rough to fill requisitions made out by students. This scheme relieves the instructor of the direct responsibility in this regard, and also has the advantage of leaving the materials in the hands of one person. In the use of lumber, this should result in a distinct saving of material, since more economical use of all pieces could be expected.

Another approach to the solution of this problem is to assign students to the duty of supply clerk in much the same way as tool clerks are assigned. The value of such an assignment has been pointed out especially for high-school classes where one of the objectives is that of training future managers and foremen. In this connection, a rather complete system of bookkeeping can be evolved, including also a perpetual inventory, through which a complete check is kept at all

times upon the materials remaining in stock. Where classes are large, this type of work can obviously furnish excellent practical experience in maintaining stockrooms.

Another source of assistance in keeping accounts of supplies is the commercial department of the school. Often this department will welcome the opportunity for work under practical conditions, and the school shop may be made to furnish a setting similar in many respects to commercial plants.

Organization for Quantity-Production Work

Quantity-production jobs in the school shop offer special opportunities for student assignments in leadership situations in addition to giving a natural setting for work experience paralleling the routine and the personnel organization of modern industry. Quantity production is known as that form of activity which results in the manufacture of a number of similar articles, as a dozen chairs or desks, or trash cans, or what not. The product from such effort may be sold, used by the school board, or divided among the class members. If used by students, members of the class agree upon an article that each will want when finished. The class is then organized for the production of the required number, and the members each receive one when the job is done.

Some teachers are inclined to look upon production work as merely a chance for the school board to exploit students; others are enthusiastic about its values. While one instructor fears the loss of interest if such activity is engaged in, others testify to the fact that enthusiasm is stronger while production work is under way than at any other time.

Whether it "goes over" or not probably depends more upon the instructor than the students. Lack of interest on the part of the teacher, lack of knowledge of methods involved in manufacture, or lack of faith in the purposes and principles under which the scheme is undertaken will go far

to prevent its success. Some instructors, sad as it may seem, are still dominated by the natural human characteristic of resisting the introduction of anything new.

Advantages of Production Work

Those who are favorable to this type of procedure in the school shop refer to the following advantages:

1. *It is the method of industry.* One of the objectives of shopwork in schools is always to give opportunity to explore and study occupations. Individual work, where one person completes an entire product, is not common in modern industry.

2. *It puts "drive" into the work.* Students who have difficulty in realizing time values when working on individual articles for their own keeping are now matched against other students in such a way that an apparent measure is given in the comparison. If this is not enough the student will probably be told in plain words by his fellows to "speed up."

3. *It raises standards of workmanship.* The student may make a bad joint on his own piece of furniture and expect to remedy it. But if he cuts all tenons too thin for twenty tables he will face a different situation. When made a member of a working organization, many things which the teacher has been helpless in impressing are impressed by force of circumstance.

4. *Coöperation is developed.* The spirit of give and take is a very necessary one in life and in employment. Individual work for individual profit is not likely to develop it; production work may.

5. *It discovers and develops managerial ability.* Leadership qualities are found through this type of organization, where the class is divided into groups with students acting in foremanship and managerial capacities.

6. *It gives an opportunity to inferior workmen.* There are

many conscientious, willing students who cannot, with all their trying, produce a completely finished article of which anyone can be proud. In a production job they can be placed according to their level of ability and be happy and successful. They will contribute in their way to the finished product and be proud of the job. They may also be helped to an occupational choice in semiskilled work in industry.

Disadvantages of Production Work

Those who oppose this type of work also give reasons for their position, among which the following might appear:

1. *Group work takes away the feeling of individual responsibility.* It leads to laxity on the part of the student because, in the long run, no one else knows which was his specific part in the project.

2. *It produces loafers.* In almost any school shop it is not possible to provide jobs continuously for from eighteen to twenty-four students on any project. Some soon get in the habit of standing back and loafing on the job.

3. *It kills interest.* Students wish to construct work for their own use. They lost interest in production work, unless it be for distribution among the class members. Even then they are not so keenly interested as if they were doing individual work for themselves.

4. *Students are exploited.* The work starts under promising conditions. But often too large jobs are forced upon the class, or jobs that have little instructional value, and the class becomes simply a group of laborers for the school.

5. *It makes teaching difficult.* More work is added to teaching activities. Some of this comes from dealings with those who are to use the product, some from having to perfect a new organization, some from being left with unfinished work in the last rush of closing the semester or year. The responsibility is also greater because of the value of the

product and the danger of mishaps by inexperienced workmen.

A Typical Quantity-Production Job

Let us assume that a class in tenth-grade woodwork has accepted the order for twenty teacher's desks, including the finishing. Each desk is to have a set of drawers and a low rack on the top for pen and ink and for holding cards and other memoranda. There is to be a self-locking device for the drawers. The class consists of seventeen boys. The following will indicate a suitable method of organization:

1. *Selecting manager and group foremen.* The first step in a typical organization for such a job would be to appoint or have the class elect (under advice) a general assistant manager who would work directly under the instructor. The remaining sixteen students are divided into groups of four each, with the personnel so divided that the strong students are equally distributed among the various groups. The most capable of the four is appointed foreman of the group.

2. *Dividing up the jobs.* The next problem would be to find a sufficient number of approaches to the job so that each group may begin to work on a separate job. In this case a good solution would be to assign Group I to making the frames; Group II to the tops; Group III to drawer construction; and Group IV to the racks to go on the desk tops.

3. *Bills of materials.* It is assumed that general drawings and reasonable details are to be furnished at the outset. Bills of materials for the specific parts to be manufactured would be made as the first important step and checked first by the assistant manager, then by the instructor. Such bills of materials should list both the rough and finished sizes when made out for use of inexperienced persons. This means that each group would be held responsible for the bill of materials covering the work it is scheduled to do. In some cases the

foreman of the group might work these out rather completely before the meeting of the class. This would save some confusion which is likely to arise if there is not a definite assignment for each student.

4. *Instruction sheets.* The success of a production job with students depends largely upon two things: (1) definite understanding by everyone of what is required of him in order that his work may dovetail into that of the others, (2) a ready method of reference and check-up of the steps of procedure. The instruction sheet meets both of these requirements. An instruction sheet should be made up covering each minute detail of the work, and should be organized to apply to one unit at the time.

For instance, in the construction of the drawers, one sheet would cover getting out stock in the rough, another the making of the fronts, a third the grooving for the bottom, and so on. By this method every student would have near at hand an outline of the proper procedure, and the customary serious errors that are accepted by some as unavoidable would be eliminated. A system will go a long way toward getting acceptable work from inexperienced students particularly where a variety of projects is under construction.

These instruction sheets may be furnished by the teacher, but from the standpoint of bringing education into the project it would be better if they were made up to a large degree by the groups. If the latter procedure is accepted, the groups may be working on bills of materials and instruction sheets at the same time. With these two activities going on simultaneously, there should be work for everyone. Those students who are less aggressive will be used to collect data of various kinds that will be needed in the process, such as checking on kinds, thickness, and width of lumber available. They may also assist in the final checking and perhaps conditioning of the equipment to be used. However, the prepara-

tion of the equipment should not be considered as a preliminary for the production job.

Needless to say, the bills of materials and the instruction sheets must receive extremely close inspection from the instructor after they have passed through the hands of the foremen and the assistant manager. One of the most serious pitfalls in this connection is the tendency for the instructor to place too much reliance on students and to get too busy to catch errors in the working plans.

5. *Checking levels.* A definite system for checking at certain points in the progress of the job is absolutely essential, and so is the conscientious use of such a system. All the way from the student and foreman to the instructor there should be predetermined points beyond which the work may not progress without specific inspection and approval. Some of these checking points would receive the attention of the foreman only, others would go through the entire organization. The more frequent these checking levels the more acceptable will be the final product, and the more value will there be in the work for the individual student.

General Instruction in Quantity Production

It may be superfluous to say that the use of foremen, bills of materials, instruction sheets, and other devices will not take place of direct instruction by the teacher. If the members of the class are fully accustomed to the use of machinery, a brief review of important points in regard to the machine involved may be sufficient; if not, a complete series of demonstrations is essential. Much of the basic instruction that every member of the class must have can profitably be presented to the entire group. While there is truth in the argument that such instruction should be given at the time when students are ready to apply it, it is also true that it is much easier, and consumes less time, to refresh the memory of indi-

vidual students or groups through a later review than it is to teach such subject matter to one or two individuals at a time when specific problems are at hand.

Furthermore, in a production job of this kind, it is probable that all the students will not have a chance to perform all operations. But this does not prove that it is not profitable to demonstrate as many as possible of the fundamental processes of hand and machine work to all the class. It appears evident, in spite of what the adverse arguments may be, that to have seen a demonstration of the setting up and operating of a tenoning machine, of making dovetail joints, or of fluting a table leg, is valuable education for all students whether they are likely to apply it to an actual problem today, next week, or not at all. And where such material is a link in a chain of performances, so to speak, and is not an introduction of a new type of work or study, there is no reason to believe that all of its value will be lost. General demonstrations, and other types of class instruction, followed up by instruction sheets, can be used to advantage; and in a production job where stress is laid on correct and standard operations as far as possible, they furnish a means for establishing a standard for the class both from the standpoint of mechanical performance and coöperative thinking.

Reassigning the Personnel

The question of how completely the line-up of duties should be changed to allow a variety of experiences in connection with production work is a pertinent one. Some would attempt to evolve a plan by which each student would get practice in each of the operations involved. This type of reasoning seems faulty in that it assumes that all students are capable of doing any phase of the work, and, further, that the chief value of such a job lies in the variety of manipulative experience.

Organizing the General Shop

A general shop is usually thought of as a shop which is organized and operated for teaching two or more subjects or subject-matter areas at the same time by one teacher.[1]

The evolution of the general shop has brought about greater opportunities for broadening and enriching the program in industrial arts. At the same time, however, the general shop will usually multiply and complicate problems of organization, management, and teaching procedure, all of which will require special consideration and planning if the hoped-for objectives are to be realized.

The general shop has found favor mainly in smaller schools where several unit shops are not economically feasible, and for the junior high school level, although they are by no means confined to these areas. General shops are used effectively to offer short exploratory courses in high schools, both as general industrial arts activities and for basic exploration and investigation leading toward occupational selection.

Advantages of the General Shop

The following characteristics are listed by Newkirk[2] as largely responsible for the popularity of the general shop:

1. It is well adapted to the organization of industrial-arts content in the light of the general education, exploration, and guidance aims of the junior high school.
2. It permits students to be treated as individuals with due respect for their differences in interest and capacity.
3. It enables a student to discover his abilities and aptitudes through manipulation of a wide range of materials, tools, and the processes that go with them.

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[1] For a more comprehensive discussion of types of general shops, see Chapter XIV.

[2] Newkirk, Louis V. *Organizing and Teaching the General Shop.* Chas. A. Bennett Co., Inc., Peoria, Illinois, p. 19.

4. It offers an economical way to gain experience in many activities.
5. It makes possible an adequate industrial arts program for the small school.
6. It stimulates the setting up of a well-planned shop and a carefully organized teaching content.
7. It increases teacher efficiency.

Class Management in the General Shop

As suggested previously it is likely that the very nature of the general shop will create problems in class management and teaching procedures beyond those present in a unit shop. The teacher might well proceed with caution in the selection of the kinds and the number of separate activities to be included. It is better to succeed in the handling of three or four activities than to fail in attempting a much greater number. Just how many and what kinds of activities should be attempted will depend upon several factors, some of which would be: (1) variety of craft skills possessed by the teacher, (2) his experience and ability in organization and management, and (3) his ingenuity and resourcefulness as a teacher.

With reference to suitable areas or activities of industrial arts content which may be considered basic to a general shop, Newkirk [3] suggests the following: woodworking, metalworking, drafting, graphic arts, ceramics, electricity, plastics, transportation, and textiles. Obviously selections from these areas or any other selection of content would be made with reference to local conditions, and in the light of objectives carefully developed before such selection is made.

The general shop offers a unique opportunity for student-participation in management beyond that of the unit shop. The various assignments given to students, discussed previously in this chapter, can be increased because of the fact that

[3] Ibid., p. 44.

the grouping of students into different activities furnishes opportunities for more assignments. If tools are located in various cabinets, one tool clerk can be used for each. The same idea will apply to materials, reports, reference library, student evaluation of projects, and others.

Problems of Instruction in the General Shop

Some suggestions regarding teaching procedure would seem appropriate here in addition to the general discussion of this subject in Chapter II. Class demonstration will probably be used less frequently than in classes where all students are working with the same tools and materials. Some teachers start the class with a series of short demonstrations covering each job or basic operation to be undertaken by the members of the class. These demonstrations are given to the whole class and actual work is suspended until the entire series is completed. After these preliminary demonstrations are completed, the class demonstration would probably be used very little in the comprehensive general shop. Group demonstrations will be more applicable and should be relied upon in order to save the teacher's time. Individual demonstrations will be used frequently because of the spread of work. The necessity for "being on the move" and not spending too much time with any one student at a time will be more pressing. Record keeping is more necessary and more complicated, because of (1) greater variety of materials, (2) more instructional units, (3) more need for progress charts, (4) larger variety of jobs, (5) less time with class as a whole.

A number of additional teaching techniques which have particular application to the general shop setting might be mentioned without exhausting the list: (1) use of instruction sheets and instruction manuals, (2) reference material and sources for projects which may be selected or altered by students, (3) use of slides, strip film, and motion pictures,
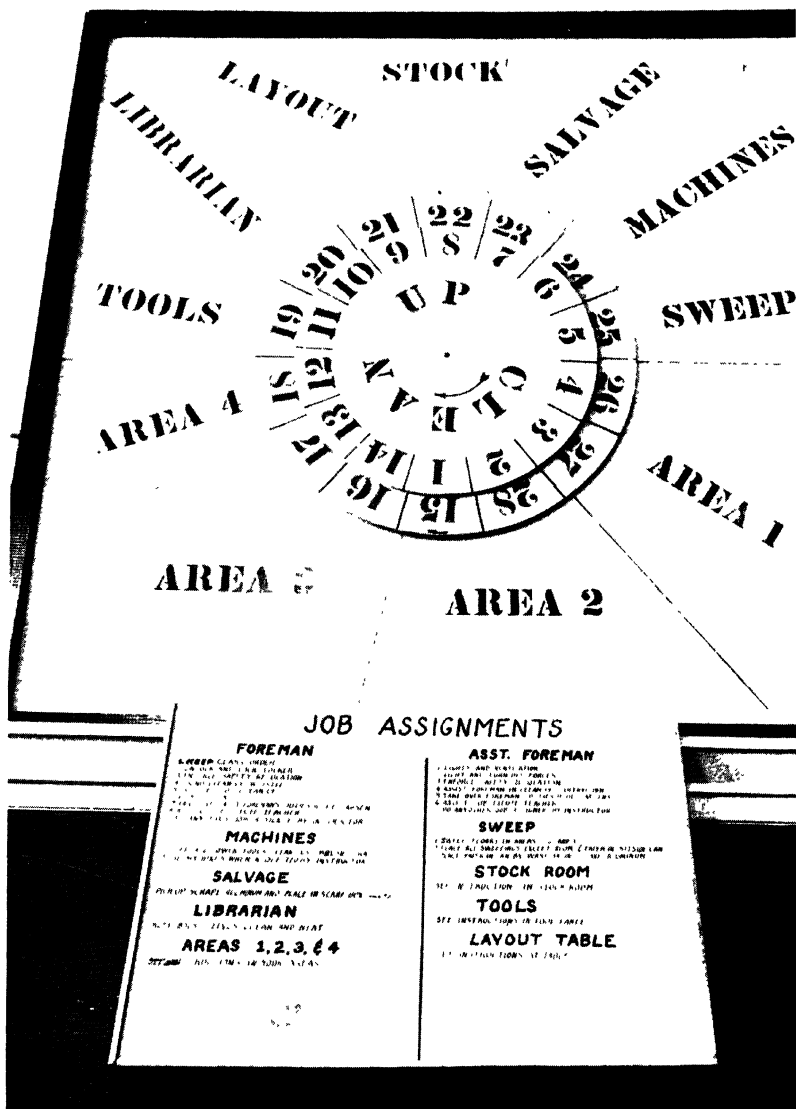
FIG. 14. A chart of the type shown here will assist in orderly assignment of student duties and will give definite instructions for carrying out assigned jobs.
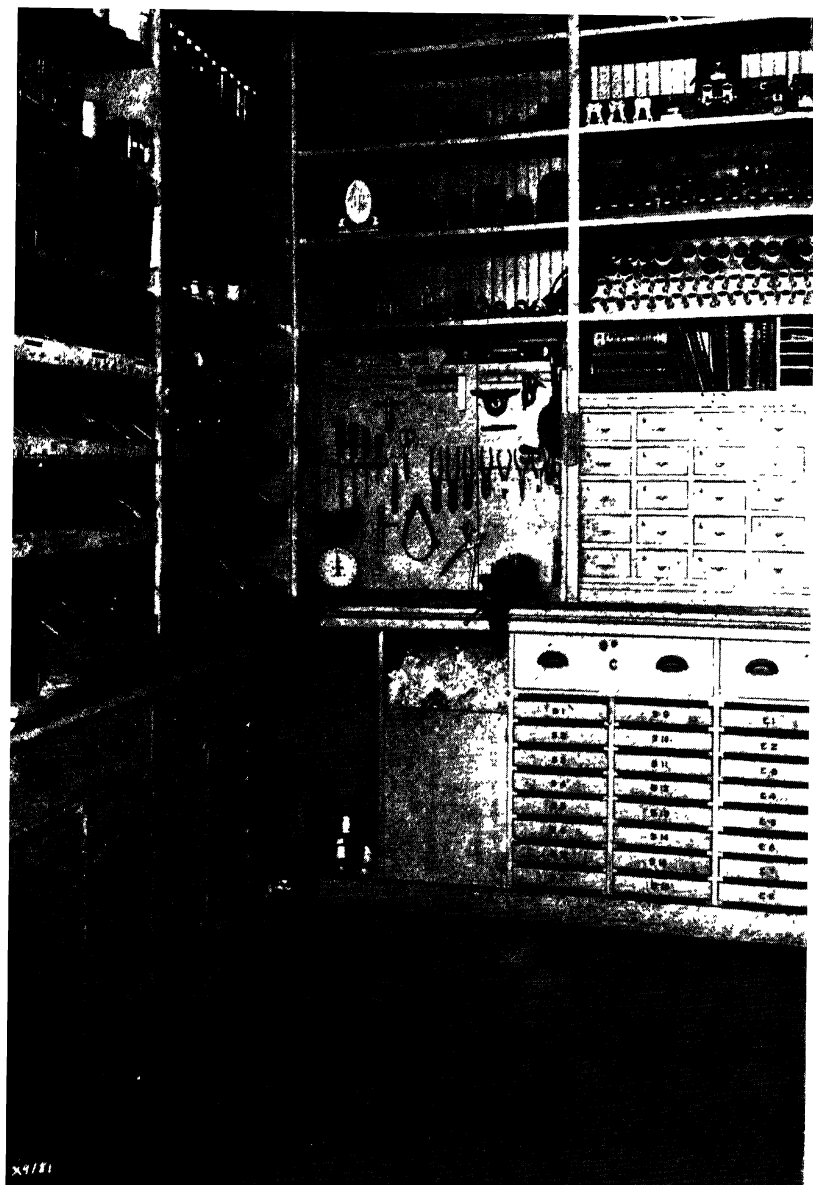
Fig. 15. An example of a well-organized tool room.

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FIG. 16. A well-arranged tool case with recessed doors has advantages over the toolroom for industrial arts.

Fig. 20. A home workshop is an excellent means for development of resourcefulness and independence.

(4) student reports on special assignments, (5) student planning, both with reference to drawings of projects and of proper steps of procedure in their production, and (6) evaluation procedures carried out by students and teachers.

Under efficient management the general shop organization can become a definite instrument for expanding the concept of industrial arts as general education. The resourceful teacher, who is willing to invest the necessary time and energy in organizing the students for participation in the management of the shop, will render further service to this concept.

Industrial-Arts Work for Girls

Not enough has been done toward giving girls of the secondary-school level opportunities to work with tools and materials. More emphasis needs to be placed on the necessity for giving girls a preparation for living in our new age of machines and appliances, as well as for enjoyable leisuretime activities. In general, there are two areas of activities that appeal to girls, (1) household mechanics, and (2) the industrial-arts crafts. Classes may be offered exclusively for girls, or enrollment may be mixed. From the standpoint of organization, class management is the same for girls as for boys. In mixed classes, however, there may be a tendency for the boys to assist the girls with their work, and for the girls to expect such assistance. Definite organization on the part of the teacher will establish proper coöperative attitudes. No more difficulty should be experienced here than in other laboratory classes containing mixed groups.

Correlation in Shopwork

Much valuable and interesting work can be arranged for shop classes through the coöperation of other instructors and other departments. This fact is often overlooked through

lack of vision or through misunderstanding. Such correlation might well begin among teachers of the various shop subjects. There is no reason why some parts of a project cannot be made in one shop, and other parts in another, even though the product will be individually owned. Nor should there be objection to having certain parts constructed in one shop one semester and the complete job turned out in some other shop at a later time.

Only a part of the scope of natural student interest and desire for expression lies within the work of any single shop. Unless teachers of unit shops can correlate their work, they will deprive youth of some of the fine opportunities for expression now offered in the general shop. A model boat can be made in the woodshop and a motor made for it and installed in the electric shop just as readily under a system of unit shops as in the general shop, provided that the teachers concerned are aware of the needs for correlation of the program.

Correlated and coördinated projects can and should be arranged between various departments of the school. The line of least resistance is to plan one's own work for the class. But to do so always might limit unduly the experiences of the group. Consider, for instance, the project of making scenery for a school play. This is a problem with which most teachers are familiar. Instead of considering such a piece of work a necessary evil and preparing, by word and action, the students' minds against it, why not welcome it as an opportunity for a splendid, correlated project? If such an undertaking is looked upon in the proper light, it can easily furnish experience and give knowledge far beyond what the woodshop itself can give.

"Yes," you say, "*but*—I am teaching woodwork!" Certainly, but ten years from now the skill in making a mortise-and-tenon joint will not be the biggest value to nine out of every ten of your students. Besides, if that skill can be col-

ored by contacts with the work of the art department and of the drama class, it will disappear no sooner than if obtained through more formal assignments. The teacher who wishes to popularize and vitalize his teaching, then, might well reach out for opportunities to correlate his work and make it fit into a larger sphere of educational activity.

Record Keeping

In purchasing and using supplies, the instructor should be careful to provide himself with all records necessary for future reference. In the first place, he will profit greatly when ordering supplies for the coming year or for coming classes if he has provided for himself a means of knowing how much has been used in the past, and how the materials were distributed in various classes. He can also tell where economy may be practiced through certain changes in courses of study, use of equipment, or through changes in class management and teaching procedure.

It also happens occasionally that teachers are charged with supplies that in reality were delivered elsewhere, and for this reason a thorough check should be made of all items received. Without detailed records the instructor starts each year anew as a beginner, and wastes a great deal of time and effort in getting the work under way. This applies to equipment as well as supplies.

Records of Equipment and Supplies

For convenient handling of records of equipment and supplies, the card file is probably the most satisfactory device. It makes possible easy tabulation and reference, and sheets or cards can be added or changed without difficulty. If forms of the type shown in Fig. 18, for supplies, and Fig. 19, for equipment, are used for recording information the instructor can obtain at a glance at any time the data likely to be required.

RECORD OF PURCHASE OF SUPPLIES

Types of Articles ....

Date Received	Amount	Description	Cost	Where Purchased	Address

Fig. 18. Form for Record of Purchase of Supplies. (Original Printed on Stock 6½"x8½".)

Article .... Shop ....

Inv. Date	Amt. Good	Pur. Date	Cost	Amt. Bad	Scrap-ped	Bought During Year			
						Date	Amt.	Cost	

FIG. 19. Form for Permanent Record or Inventory of Equipment. (Original Printed on Stock 5″x3″.)

With complete card files covering previous purchases of materials and tools, the instructor can save a great amount of time both in taking inventories and in making additional purchases. Once the system is perfected it requires very little time in keeping up to date.

Who Should Furnish Materials?

Is it better to charge students for materials, or to have the school furnish them? Probably, no considerable group of teachers would agree to the answer to this question. There are advantages and disadvantages on both sides. In favor of such procedure it might be stated: (1) The student feels more responsibility for his work if he must pay for the materials; (2) less material will be wasted, and better habits of thrift and conservation are developed; (3) the per capita cost to the school will be lessened, resulting in fewer objections by taxpayers in general to the high cost of schooling; (4) whatever is made on the individual basis will become the property of

the student, and always will be worth more than the materials; (5) students will be less likely to be overambitious in selecting large projects for construction; and (6) they will not insist on working with unnecessarily expensive materials.

In arguing for free materials it may be said that: (1) Some of the best students who could finish larger and more attractive articles must work on unimportant jobs because they cannot afford to pay the price for materials; (2) public schools should offer opportunities to rich and poor alike in the workshop as well as in other instruction; (3) many of the poorer students come to the school shop, and charging for materials is a cause of discouragement and of keeping down the enrollment.

A reasonable practice is to provide a certain amount of free material for the preliminary and required individual work but in advanced work on the individual basis to expect students to pay for their own. It should not be compulsory to spend money for materials, and need not be, since there are always opportunities for turning out a product for the school or for some individual who will gladly pay for the cost of the materials, plus, perhaps, a little profit to the student.

It appears unjust and unreasonable to expect, as some principals and school boards do, that full reimbursement shall be made by students for the value of all materials. When such demands are made it places the instructor in the position of a factory manager, and forces him to weaken *instruction* for the sake of *construction*. Waste in the school shop, or elsewhere, is inexcusable; but to expect to spend nothing on materials, particularly in classes of beginners and young students, is a shortsighted attitude.

Keeping Down the Cost of Shopwork

The fact that the increasing cost of education is a serious problem cannot be ignored. In shopwork, particularly, does

the per-capita cost register high. While it can easily be shown that shop teaching must necessarily cost more than the instruction in most other subjects because of the very nature of the instruction, it is also worth while to consider any possible means for keeping the expense down to the lowest possible figure consistent with efficiency in teaching. Aside from the possibility of increasing the number of students in shop classes—and this number is now great enough in many places—the following possibilities are offered for consideration in connection with the problem of costs and possible reductions:

1. Consider the purchase of good used machinery and equipment for certain types of work. Schools cannot hope to lead industry in the use of modern machines. Much of the standard machinery changes very little in principle in a few years.

2. Solicit free material and equipment from manufacturers and industrial firms. Such material and equipment can often be had for teaching shopwork if the purpose of its use is fully understood.

3. Get material by the salvaging method, such as purchasing odd pieces of lumber at the mill, making use of packing boxes, obtaining automobile parts at the wrecking yard.

4. Stop all wastage in the classes, and teach students the value of materials. Have a definite place for all kinds of odd material, and require students to go to these sources before using the new stock.

5. Have students make less pretentious articles in shops where the school pays for the material. A smaller article using less material may, and often will, serve the same purpose educationally.

6. Manufacture articles for the school, where it can be done without exploiting students.

Who Should Handle Money?

If students are expected to make payments for materials, the teacher is burdened with another detail in his routine. Experience has shown that such business transactions give him the least worry, and take the least amount of time, if he allows the money to be collected by some other agency in the school. The financial office of the school or some person in the principal's office can collect the accounts. One procedure would be to issue the materials needed as requested by the requisitions previously discussed. When all the materials have been received, and the work is finished, the instructor checks the total statement, and the student pays the amount at the office, bringing his receipt back to the instructor as a permit to remove his product.

A more satisfactory method is to require payment of materials before the student begins the work on the project. The procedure here is similar except that receipt for the money is required by the instructor before the work begins.

In such matters as replacing broken tools, and in sending for special materials, it may seem desirable for the instructor to collect money for coöperative purchasing. A good rule, however, is to keep clear of handling cash in the shop, because it takes too much time in bookkeeping and offers too many chances for getting into personal expense, to say nothing of the possibility of being subject to suspicion. Neither is it a good rule to appoint students to responsibilities involving the care of funds unless one is in position to supervise the transactions closely. Let the purchasing agent do the purchasing, and collecting, from students, if possible.

Care of the Shop Library

A discussion of shop management would not be complete without including a procedure for making reference material available. What should go into a shop library and how the

library should be used is discussed further in Chapter V. The concern here is how to house and manage such a collection of materials and how to make it accessible to students in the most efficient way. In the first place, a definite location should be dedicated to such reference material as may be available. If there is a separate lecture room or demonstration room, such a room will probably be the logical place, since reading can then be done away from the direct contact of shop activities. The important thing, however, is that the material is located within easy reach of the students.

The so-called "browsing table" has been adopted successfully in many shops. This is a table provided with racks for classified reading material, placed in some less congested part of the shop but readily available to students. One of its advantages is that no separate room is used, thereby making supervision easy for the instructor. Students can also obtain assistance more readily than when having to communicate with the teacher from another room.

Suitable cases should by all means be provided for books, and under no circumstances should careless handling of reference material be allowed. Order in the use of this material is absolutely essential, and order will be greatly promoted by having a definite place for books, pamphlets, magazines, and drawings.

Whenever books are to be taken for home use, a checking system or card system should be used. The charging of such books can be taken care of by a student who may be appointed librarian and have full responsibility for the reference shelves. The duties for this office should be rotated as in the case of the toolroom clerk.

School Repairs

A majority of teachers feel a strong resentment against taking care of odd repair jobs in their classes. Seldom do a

number of such instructors get together without the conversation being directed toward this important topic; not so much, perhaps, in order to better conditions, as for the purpose of expressing mutual indignation.

The common cry against the superintendent or principal who wishes to have some cafeteria chairs repaired in the woodshop, or who comes to the electric shop when a switch fails to operate or when an electric iron cord in the sewing-room does not function, is that such requests interfere with the course of study and with organized instruction in the shop. A second objection, which is not always expressed to the superintendent, is that this practice lowers the dignity of the instructor and reduces him in rank to the level of a janitor or school carpenter, and that it simply makes the students his helpers in keeping the school plant in shape.

Both of these objections are valid in so far as they are true. And the sad part is that they are often true. Through personal experience and that of fellow workers, shop instructors have learned to fear "infringement" upon their plans. There are probably administrators and boards of education who are willing to let utilitarian objectives loom high, and to look upon the shopwork as an opportunity to get some returns. So-called "exploitation" is an ugly specter that stands before the instructor as a hundred-headed monster, threatening to make void his attempt to put over an "organized course."

What is Exploitation?

That leads us to the question, "What is exploitation, and what causes it?" May not exploitation be caused one day by certain work that would not fall under that classification at some other time? And, does the teacher frequently so "set the stage" through his organization and personal attitude that any little job that may come in is felt to be an infringement upon the rights of the students?

In other words, if the teacher has been careful to lay out his course on the proposition that no such work is legitimate, and has packed his course so full of what he would please to call "instructional" material that no student can afford to spend an hour or two on some special job without failing to complete the assigned work, then it might be easy to prove that any simple outside job is exploitation. And, of course, in such a case, if special jobs of any kind have to receive attention, it often falls upon the conscientious teacher to do the work in preference to using the time of students.

This again leads to the questions: Who has decided that it is instructional to build a library table and noninstructional to repair a table for the school cafeteria? Or, why is a teacher reduced in dignity because he takes the responsibility for the repair of some school furniture? Are we not in practical life often forced to quit what we are doing in order to undertake some more urgent task? Or, is is not precisely the criticism that industry and business have directed toward the work of the school, including the traditional manual training shop, that the work has been narrow, and that a practical outlook has not been developed?

My personal feeling is that the matter of student exploitation or the lowering of the teacher's dignity is largely an attitude of mind and lack of planning and coöperation on the part of the instructor. The whole thing is largely a matter of interpretation, and shop planning and organization. Because some teachers have allowed themselves to become janitors, and others have spent much time, and lived in agony, guarding their dignity, it is not proved that repair work and rush-order jobs do not have educational value.

Educational Trouble Shooting

Of course, no one would insist that definitely planned work should give way to emergency jobs. Such a practice would

furnish an impossible situation. But the point made here is that there is educational value of a high order in such emergency jobs, and instructors should look for these values instead of closing their eyes and turning the other way for fear that their pet program might be disturbed. Up to certain limits, such jobs furnish unequaled opportunities for students: (1) to do independent thinking and planning, (2) to diagnose situations, (3) to meet "customers" and satisfy them, (4) to fit into difficult social situations in dealing with nontechnical people and handling technical material, (5) to develop ability to shift their attention from one job or situation to another and back again.

The following is a suggested organization for making a number of odd jobs instructional and educational in any shop:

1. Let the teacher change his viewpoint toward the value of emergency work. Such work probably furnishes the most real jobs that come into the shop.

2. When the course of study is made up, leave a definite, unscheduled amount of time in each student's program for taking care of special jobs.

3. Prepare the minds of the students for such work by pointing out the added values that come from it. The boy's frame of mind will follow closely that of the teacher in this respect.

4. Arrange the work schedule for the class so that one or two students, depending upon recognized needs, are scheduled each day for special emergency work. These students may also do special jobs on shop equipment and new work for the schools. Keep them busy on this type of work for the assigned time and make no exceptions but see to it that the work has educational value which is recognized by the student.

5. Rotate such work fairly and evenly among all students. Any justifiable impression that favors are shown will injure the program.

6. Have students study special problems in connection with such assignments, write notes on the work done, and in some cases make reports to the entire class.

7. Check such work closely, take an interest in it, and give definite and separate grades, after first having applied the practical test, "Does it work?"

8. Finally, accept no repair work or production work for the school unless such work has recognizable educational value for the group or individual student carrying it out as part of the program.

The Home Workshop

Shopwork properly taught in the school should encourage the boy to establish a workshop at home if he does not already have one. The home workshop among boys is not so common as it should be. Where such shops exist there is usually little or no correlation between them and the school shop or instructor. A few teachers have given splendid service in this connection by offering suggestions as to possibilities in planning and in giving advice about tools. See Fig. 20. Many parents desire that their boy have a workshop because of the possibilities of occupying what would otherwise be idle time, but too often they know nothing of how to equip such a shop or how to encourage mechanical work.

If, for instance, shop instructors should spend a little time in their classes in encouraging this idea, then work out a bulletin covering needed equipment and valuable instruction booklets, offering also their personal service to the boy and the home if need be, there is a likelihood that the effort would repay in interest developed in both pupils and parents. It would add a little work and be well worth it. Much of a boy's best education is received while working in a shed or in the backyard, solving the problem of how to repair a toy automobile or put together an alarm clock.

Credit for Homework

Shall school credit be offered for work done at home? This is another question upon which there is divided comment. Some teachers have been so brave as to say "Yes," and have attempted to organize some scheme for checking homework. One method used is personal visitation and inspection by the instructor. This is unquestionably a good plan, and, when it can be carried out, credit should be permissible. Another scheme is to have a form for parents to fill out stating that the work has been done by the individual, and that it has been completed in a satisfactory manner. The latter is, of course, less reliable because of the lack of ability of some parents to tell when a fair mechanical standard has been attained, and, what is more important, because of the tendency of some parents to be unscrupulous in the desire to protect their children's grades in school.

There would probably not be enough parents taking advantage of the situation, however, to jeopardize the procedure of giving credit for homework where there is a definite set-up for doing it. A preliminary statement to parents telling of the purposes, and calling for their coöperation, would help much to establish the plan. Such statements should be so written that they would be brought back with signatures of parents before the work could begin. Neither boys nor parents are often outright dishonest if they are made to understand the standards by which their actions will be judged. Fig. 21 shows a form that may be used for receiving the inspection record of parents for homework done by students.

In this discussion of this problem the jobs that might be considered for credit would be carried as auxiliary work, and not as an independent course in itself. Some home problems could be substituted for a part of the requirements in a general shop. If the Mechanical-Progress Chart shown in Chapter

Michigan State Normal College | Roosevelt School

Instructions: Hang this card in your shop
Record and date each job in proper place when it is done.
Record improvements made in proper place
Return card signed by parent at close of school year

Name .... Age........ Grade........
Address ....

Home Shop Record

Types of work	Jobs completed	Date
General repair & maintenance Glazing, painting, gluing, plumbing, sharpening tools, farm machinery, etc.	1.	
	2.	
	3.	
	4.	
	5	
	6	
Woodwork .... Benchwork, carpentry, turning	1	
	2	
	3.	
Metalwork .... Soldering, tin can work, cold metal	1	
	2.	
	3.	
Model building .... Airplanes, boats, etc	1.	
	2.	
	3	
Weaving .... Art fibre, rope, cane	1.	
	2.	
	1	
________	2	
	1	
________	2	
	1	
________	2.	

Improvements made in shop	Date
1	
2	
3.	
4	
5.	

____
Parent's Signature

FIG. 21. Report Card for Work Done in Home Workshop.

VIII, Fig. 36, is used, jobs done at home would satisfy some of the listed work.

Perfunctory service on the teacher's part or satisfying minimum time requirements will never produce home workshops. A knowledge of subject matter alone will not inspire students to home activities. A knowledge of boy temperament must be added, as well as an interest in what he does with his leisure time; and, most important of all, the energy and willingness required to become more to the boy than just his "teacher." The teacher who is able to do these things, and willing to make the sacrifice that they demand, need not worry about the enrollment in his shop for the coming semester, nor will he need to complain that industrial arts is losing ground in the schools.

PROBLEMS AND QUESTIONS

1. Make a list in detail of all duties that may be performed by the tool clerk.
2. To what extent should tools and equipment for industrial arts duplicate those of industry?
3. How would you deal with a student tool clerk who was found to be dishonest?
4. What advantages may be listed for the honor system in the use of tools?
5. Would you as a teacher spend your own money to satisfy needs of the class? If so, under what circumstances?
6. In what ways can it be said that the teacher may be the cause for the losing of tools?
7. What should be the practice in regard to lending tools to students for doing work at home?
8. List the different age levels at which you would allow various power machines to be used in the shop.
9. Of what educational value is the use of requisition forms for students?
10. List the various duties in the upkeep of the shop and equipment which may be shouldered, in part at least, by students.

11. What reasons would you give a principal for not wishing to have the students sweep floors in the shop?

12. Should high-school students be called upon to assist in taking inventories? Why, or why not?

13. Make a form for a sheet for keeping a perpetual inventory of supplies.

14. At what age would you expect industrial arts students to sharpen edge tools and saws for the shop?

15. Make a list of responsibilities for the general foreman for a quantity-production job.

16. In what respects is it easier or harder on the teacher to work on quantity-production work rather than on individual problems?

17. Name twelve possible quantity-production jobs for a high school.

18. Is there more or less danger of accidents in the shop when a quantity-production job is under way?

19. To what extent do you believe that free choice of projects should be allowed in the junior high school?

20. Make a list of correlated projects that you believe suitable for the senior high school.

21. Make a list of suitable play articles that could be made in a ninth-grade general shop.

22. Make a list of success qualities of a general shop teacher from the standpoint of natural and acquired abilities.

23. Do you believe that school repair work has a tendency to take away from or add to interest in the shopwork? Give reasons for your answer.

24. Make a list of suitable "trouble-shooting" jobs that might be cared for in high-school industrial arts classes.

25. Draw a floor plan for a small home workshop that a fifteen-year-old boy might build and equip.

26. Make a list of tools that you would consider adequate for the home workshop of a twelve-year-old boy. Name the specific makes.

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Chapter V

THE USE OF TEACHING AIDS

What Are Teaching Aids?

As treated in this chapter, teaching aids will be thought of as a physical means used by the teacher for the purpose of strengthening the instruction and making it effective. Under this interpretation "teaching aids" will be differentiated from "teaching techniques," in that the latter constitute procedures used by the teacher in giving instruction through various teaching methods, while teaching aids are things or objects brought into play to emphasize, clarify, or vitalize the instruction. A motion-picture film would be considered a teaching aid, but the manner of showing it, preparing students for its use, and giving tests after showing it would be classed as techniques.

The following might be listed as among the more common teaching aids for industrial arts:

- books
- shop manuals
- instruction sheets
- motion pictures
- still films
- catalogues and advertising material
- models and mock-ups
- cutaway or sectional equipment
- sample projects completed or disassembled
- magazines
- printed designs and drawings of projects

Use of Books for Industrial Arts

Books available for use in teaching industrial arts may be divided into several classes: (1) textbooks, (2) problem and

project books, (3) shop manuals, and (4) reference books. Each of this type will be discussed briefly.

1. Textbooks furnish definite, basic information regarding the subject covered. In them should be found detailed explanations covering the fundamental mechanical operations, as well as information that has bearing on the subject as a whole, rather than the construction of articles and projects. The mission of books of this kind is not to furnish outlines for courses or to give drawings and directions for things to be made, but rather to treat the tool processes involved and to furnish directions for proper tool processes, and for attaining skill in the handling of tools. They may also treat related and technical information pertaining to the subject. The skill or knowledge thus attained will then be equally useful in the construction of any article upon which it is applicable. Textbooks as here defined are intended for individual use of students.

2. Under the classification of problem or project books comes the type that covers specific projects that may be made in the shop, with drawings, photographs, and specifications for such projects. These books may or may not include working directions for making the articles for which designs are furnished. They often take for granted that the worker possesses the general knowledge of tool processes and the skill required, or that information about how to handle tools will be obtainable elsewhere; and they make no pretense at anything but to furnish ideas, drawings, and designs that may be worked out in the school shop. Books of this kind are probably the most popular of all among instructors of shopwork, since they bring with them new and varied ideas to the large majority of teachers who lack training or aptitude for making original designs.

3. A shop manual is here classified as the kind of printed help that furnishes, mainly, detailed directions in steps of procedure for work to be done, and usually makes these direc-

tions apply to specific, prescribed projects or processes. Such manuals may include also such bills of material, drawings, lists of tools to be used, and other data, as are needed for the proper completion of the job at hand. Under this classification would come books made up of job sheets, and other instruction data covering a prescribed set of articles and problems. Courses of study are sometimes expanded into this form of material so that the instructor or student receives working directions at the same time the scope of work is prescribed. In many respects this form of material is similar in organization to the well-known physics and chemistry manuals used in schools. They may or may not be purchased for individual use of students, but whenever they cover the work sufficiently well they can profitably be supplied on the individual basis.

4. Reference books fall in a different classification from any of those mentioned so far. Their place is in the shop library, and their principal usefulness is in connection with immediate needs for information. They are valuable to students and teacher alike for obtaining data of the related-information type, or for solving problems or determining upon methods of procedure. Under this class come also all sorts of catalogues, and some manufacturers' instructions regarding scope of work and special uses of machines and equipment.

Objections to Books

In spite of the growing popularity of books in the school shop there are still some teachers who do not seem to accept them as a valuable asset. To explain this attitude, the following reasons have been given:

1. *Textbooks limit the program.* Teachers argue that they do not wish to tie up to a "stereotyped" program such as is indicated by a book, or to follow instructions for students laid out by someone in some other locality. "It will not fit," is the usual comment in this connection.

2. *Teachers prefer to use their own methods.* Some teachers have so much respect for their own methods and practices which they have obtained by practical experience or otherwise that they cannot tolerate the thought of different suggestions coming from some other source. There is fear that damage may be done to the students from learning about methods that the teacher considers inferior to his methods and practices.

3. *The expense is considered.* Leaving out books will reduce the per-capita cost where books are furnished; or will reduce the cost to the student where he must purchase them. It is assumed that larger enrollments will result if the expense to the student is kept down—that is, the boys come to classes because they are cheap. Such teachers adopt the same attitude regarding their own professional books; they do not wish to spend the money.

4. *The habit must be formed.* Some instructors have never formed the habit of using books and other written material in their work. They began to teach long ago when such material was scarce, and do not realize that "times have changed." The experiences of others have never been capitalized by these few and probably never will.

5. *Some are afraid.* They fear that what they are doing will not measure up to accepted standards, and that they will be forced to exert themselves more vigorously if textbooks are brought in. "Ignorance is bliss," among students, and it is better to leave well enough alone.

All these arguments against books for shop subjects could equally well be presented against books for mathematics, English, history, and other subjects. I once knew a teacher who used no textbooks in algebra, and who gave several of the reasons enumerated here to justify himself. No student in his class shared his opinion, however, that the teaching was more effective without a textbook.

Why Use Books?

The following reasons have been given for using textbooks in shop teaching:

1. *Textbooks encourage the covering of a definite scope of work.* This would hold for mechanical drawing as well as auto mechanics. They also furnish a means of checking whether the scope has been covered.

2. *They check the instructor.* His methods and practices will necessarily be compared with those suggested in the text. This means that he must be on safe ground always and have good reasons for making variations.

3. *They fix the responsibility on students.* Textbooks help to hold students responsible for a minimum amount of information and knowledge. The excuse that they "did not hear" or "did not understand" cannot be effectively used if a certain chapter containing the material has been assigned.

4. *Practice in reading is necessary.* Ability on the part of the student to read and interpret technical materials may be of great value in later life. Too many people go through the school shop with the habit of leaning on the teacher for all information and inspiration. Independence and resourcefulness are not developed in this way. In all vocations of importance the ability to be guided correctly by written material is of benefit, and such ability is extremely essential in all phases of mechanical and technical work.

5. *Books specify standards.* Methods of procedure in mechanical work, in construction, and design need some common interpretation. There is a tendency on the part of teachers to be local in their shop practice and narrow in their vision of possibilities. Without some outside help or guidance, instructors practice unreasonable variations in quality and types of work required of students of different grades and ages. Books tend to standardize teaching procedure.

6. *Books assist in teaching.* They enable the instructor to

give more attention to the auxiliary details and to do more actual instruction by relieving him of the responsibility of imparting routine information.

7. *They are an economical investment.* Whatever time the teacher can save through the use of a textbook or other written material is a direct saving to the school. For at the best there is never sufficient time for doing all the work that the willing teacher sees to do. A book costing a dollar or two will save time for the teacher to the actual value of many times that sum.

Textbooks for shopwork should not be used to take the place of personal instruction any more than textbooks in mathematics can eliminate the teacher. Where the use of a text causes the instructor to withdraw to his desk or office, such text has probably done more harm than good.

Values of Books and Reference Material

Books and reference materials, then, may be used in the shop in several different ways:

1. *To prepare for the demonstration.* Before a demonstration is to be made, a certain part in the textbook, or specified references, may be assigned for study. Such study would familiarize students with names of tools and technical terms in connection with the work to be covered, and, in general, prepare the minds of the class or group for the work to be presented.

2. *To emphasize and follow up oral instruction.* Some instructors prefer to use text and reference material to support and review demonstrations and oral instruction. When this method is used, the teacher will introduce the subject matter in a general way as briefly and effectively as possible, but leave out such details as can be covered later through the reading assignment. Such procedure is not only a saving of the teacher's time, but, most important of all, it makes it possible

to put the students upon their own resources for acquiring a part of the facts to be learned.

3. *To furnish a guide for manipulative processes.* The most complete type of published material for this purpose is the instruction sheet. (Instruction sheets are discussed more fully in Chapter II.) Textbooks, also, usually contain directions for procedure in actual work, particularly for covering fundamental manipulative processes. When classes are large or divided into groups engaged in a variety of work, such use of printed teaching material becomes very important. It may be appropriate here to emphasize again the value to the student, whether the class is vocational or otherwise, in getting some experience in working from printed instructions. The practice of having students copy in their own notebooks the steps of procedure is a waste of time if written instructions are available.

4. *For related information.* In the discussion of the shop demonstration, Chapter II, stress was laid upon the danger of bringing in too much related information and thus destroying the emphasis upon the work demonstrated. To attempt to present in oral form to the class all the facts that should be learned aside from the manipulative work is likely to be wasteful of the teacher's time and tiresome to students.

Motion Pictures and Still Film

Motion pictures and still films have found increasing favor as a means in teaching. In spite of what appears to be popular interpretation, however, they do not constitute the whole of the field of audio-visual education. That term correctly interpreted would logically include all the teaching aids mentioned in this chapter.

Motion and still pictures have a definite place in industrial teaching, provided that the instructor appreciates their proper use and will prepare himself and his class toward their maxi-

mum contribution in the educational program. In the first place, the idea of showing pictures for pure diversion and entertainment should be ruled out. After that is done there are at least three classes of pictures that will be found valuable: (1) those that illustrate mechanical operations and work processes directly applicable to the work to be done in the school shop, (2) those that give information regarding related technical data and knowledge about materials, manufacturing operations, etc., and (3) those that will enlarge the students' vision with reference to occupational opportunities and employment conditions in specified areas of occupational life.

Many good films have become available under the first of these headings. Intricate parts of classroom demonstrations may now in many cases be shown more effectively through a motion picture or a still film than they can by manipulation on the part of the teacher. The fact that distractions from outside sources are eliminated in pictures, and that "close-up" photographs can be shown large on the screen, contribute to their advantages. Care must be taken in the selection of films showing work operations and techniques, however, for not all films advertised are likely to satisfy the instructor in regard to methods of working and other details.

Films giving technical and related information are available in greater number and variety than those showing work processes. But here again selection must be made carefully because of the fact that often the film is produced largely for the purpose of advertising rather than for giving technical information. The field here has become so rich that there is no need for spending students' and teachers' time and interest on inferior selections.

Knowledge of occupational opportunities, an essential part of the education of every student in secondary schools, can be largely acquired through suitable films. Here, motion pictures are probably superior to other types of films or illustra-

tions because of close similarity to working conditions that can be produced, including the sound of machinery.

Procedures in Using Films

As suggested previously, just to obtain a few films and have a "picture show" does not signify that students are realizing significant values from the performance. The following suggestions for using films for educational purposes will indicate accepted procedures:

1. The teacher should make himself thoroughly familiar with the content of the film through catalogue descriptions and previews.

2. The film should be evaluated for its specific contribution and its possible contribution to the area of learning under consideration. Here the question would be asked whether the contribution is specific and applies to a single fact or process such as cutting gears for a machine-shop class, or whether it will contribute to a broad understanding of a subject such as the Bessemer steel process.

3. After the film has been analyzed and its specific value has been determined, the next step is to motivate the students and assist them to obtain maximum benefits from the film. This may be done either by oral discussion or by preparing outlines and questions covering the content to be presented.

4. The method of presentation of the film is important. Having selected the film carefully and prepared the minds of the pupils for receiving education from it, give the necessary time to make the actual showing effective. To do this, it is often necessary to discuss the film after the first showing and then show it again either partially or in full.

5. A final check of values received by students is an essential feature in effective use of films. This checking, which may be either oral or written, will help to correct wrong impressions received from the film and will serve to emphasize the

objectives for which the film was shown. The following evaluation sheet suggests a type that should be found useful in appraising educational values of a film:

FILM EVALUATION SHEET

Film Title:________________ Class Title:________
Grade Level:________________ Source of Film:________
Silent________ Sound________
Color________ Black & White________ Length of Film______

	Ex-cellent	Good	Fair	Poor
1. Introduction of the film.				
(a) Title (self explanatory)	☐	☐	☐	☐
(b) Creates interest (thought provoking)	☐	☐	☐	☐
2. Condition and quality of the film.				
(a) Photography (clear, easily seen, close ups)	☐	☐	☐	☐
(b) Sound (clear, interesting voice, descriptive)	☐	☐	☐	☐
(c) Up to date (materials and methods not outdated)	☐	☐	☐	☐
3. Sequence of development.				
(a) Unity (organized to one end)	☐	☐	☐	☐
(b) Continuity (interlocking presentation of orderly facts)	☐	☐	☐	☐
(c) Completeness (no serious omissions)	☐	☐	☐	☐
(d) Clearness (easily understood)	☐	☐	☐	☐
4. Student interest.				
(a) Fits age level (language, examples)	☐	☐	☐	☐
(b) Timely and correlated (fits into classwork)	☐	☐	☐	☐
(c) Carry over (interest after showing)	☐	☐	☐	☐
(d) Length of film (correct length for interest)	☐	☐	☐	☐
5. Educational.				
(a) General information (contributes to general knowledge)	☐	☐	☐	☐
(b) Technical information (specific, factual)	☐	☐	☐	☐
(c) Worthwhile (desirable knowledge)	☐	☐	☐	☐
6. Advertising (does not detract from purpose of the film)	☐	☐	☐	☐

General Remarks:________________
Your Rating: 1. Excellent________ 2. Good________ 3. Fair________
4. Poor________

Sources of Films for Teaching

Films may be (1) rented, (2) purchased, (3) produced locally, or (4) borrowed from various sources.

For smaller school systems it will probably be found more economical to rent most motion-picture films of the type that would be used in industrial-arts classes. Still films and slides which are planned as a definite part of the instructional program will be found more useful if made available through local ownership. This, of course, implies that the subject is such that the processes and facts to be shown are not likely to be changed and made obsolete until a reasonable period of time has elapsed.

Under the possibility of local production, film slides either in black and white or in color can easily be produced with very little special equipment. It is advisable, however, not to attempt to produce functional motion pictures without a background of technical experience. Some experimentation with film slides may be carried on inexpensively. The result will help to stimulate interest because of the "local color" even if the pictures are imperfect from an educational standpoint.

Many valuable films are available without rental charge by industrial or other firms who make them available as a part of their publicity program. In using these, care should be taken that the time of pupils is not wasted because the film is free. The tendency to use films that furnish principally entertainment, with little or no application to the subject or curriculum of industrial arts, or to the broader field of industry in general, might well be discouraged. Further discussion of the use of films will be found under Chapter VII.

Using Models and Mock-Ups

Models were one of the earliest forms of teaching aids used in industrial arts. The highly concentrated training program of the armed forces of World War II greatly revived and

popularized the use of models in almost every phase of instruction. Scaled models of airplanes, ocean-going ships, airports, armored equipment, and scores of other types were produced without regard to cost. Added to these were the "mock-ups" which had received extensive previous development mainly in the aircraft industry. While schools cannot and probably need not adopt the practice of using these aids to the extent indicated by the armed forces, it would indeed be a nonprogressive teacher who would not see in these aids an opportunity for putting new vigor into his teaching and fresh interest into his program. See Fig. 22.

Scaled models will probably continue to find their greatest usefulness in connection with the teaching of aviation and aviation mechanics so far as their illustrative value is concerned. The construction of models by classes when carried out does not obviously come under the classification of teaching aids. Mock-ups, arranged on wall panels, or in the form of floor units, can be made to illustrate segregated phases of complicated controls and mechanisms, such as hydraulic systems of a plane or wiring of an automobile.

Cutaway or Sectioned Equipment

Cutaway equipment constitutes an exceptionally valuable teaching aid. This is especially true in regard to operating power units and similar equipment, such as aircraft engines, automobile engines, electric motors, starters, generators, carburetors, magnetos, etc. Many of these may be available from manufacturers or from the armed forces. They can be made up in the school shop, however, from equipment on hand. Usually it is not essential that late models of equipment be used for this purpose, since the purpose of the cutaway equipment is to teach principles rather than up-to-date operation or expert maintenance. Their value lies in the exposure of internal and otherwise hidden parts and functions. See Fig. 23.

Other Teaching Aids

A few additional aids mentioned in the early part of this chapter deserve further emphasis. See Figs. 24 and 25.

Sample projects made either by the instructor or by students constitute a valuable means for stimulating interest and for indicating construction procedures. These articles can often be made collapsible, so that they can be disassembled for inspection. Care should be taken, however, to see that all articles of this type represent the best of design and workmanship. The tendency to keep good sample projects indefinitely should be guarded against. A project of this type may be good, but it is seldom good for ten years or more.

The need for furnishing an abundant supply of ideas and designs for student projects through blueprints, catalogues, magazines, etc., can hardly be overemphasized. A method of handling such material to the best advantage through student participation has been discussed in Chapter IV, where the "browsing table" was referred to as a solution. Students should be given a chance to choose projects for construction up to a certain measure. They should not, however, be expected to be able to design these projects or have resources to draw upon without definite assistance.

PROBLEMS AND QUESTIONS

1. Would the fact that textbooks are used in all academic subjects be a good reason for using them in the shop also?
2. From what sources may inexpensive material aside from books be obtained for industrial arts classes?
3. Make a list of points under which any textbook for industrial arts may be evaluated.
4. How much reading outside of class time would you expect from ninth-grade students?
5. Make a list of fifteen books for the library of the woodworking shop and finishing room.
6. Make a list of fifteen books that you would include in the library of a general metal shop.

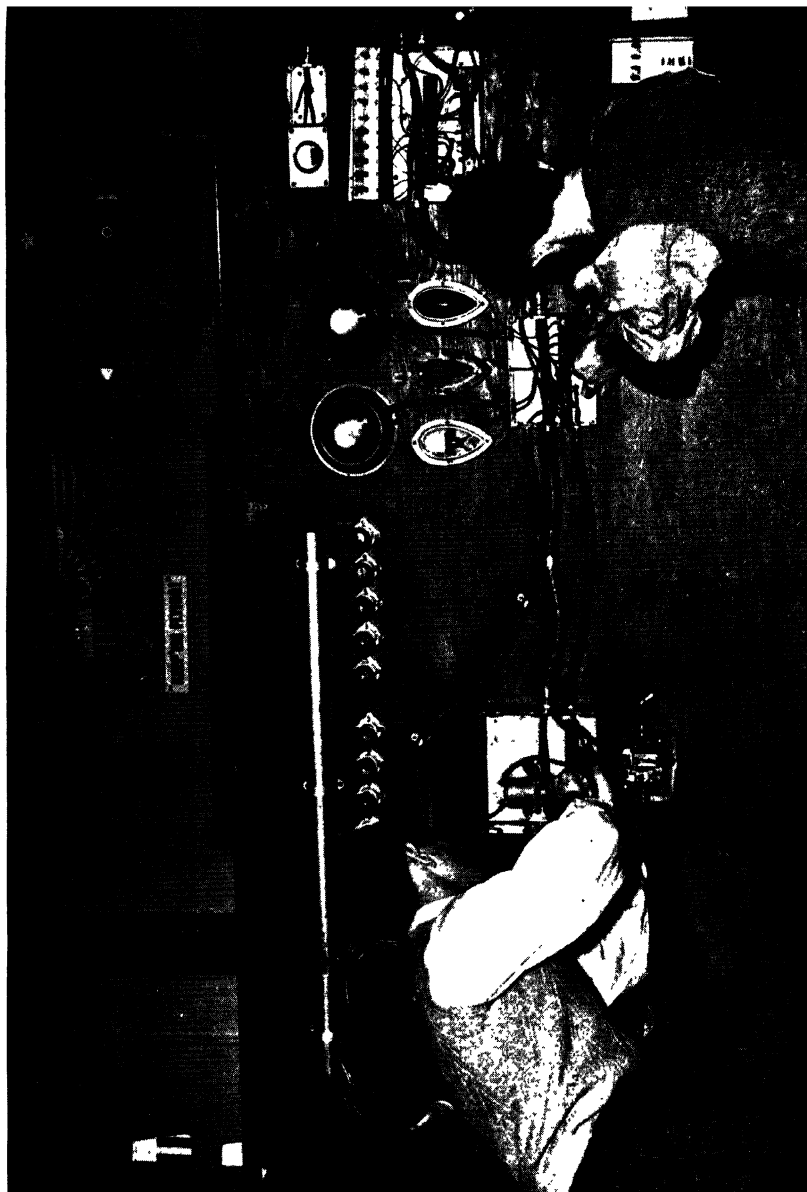



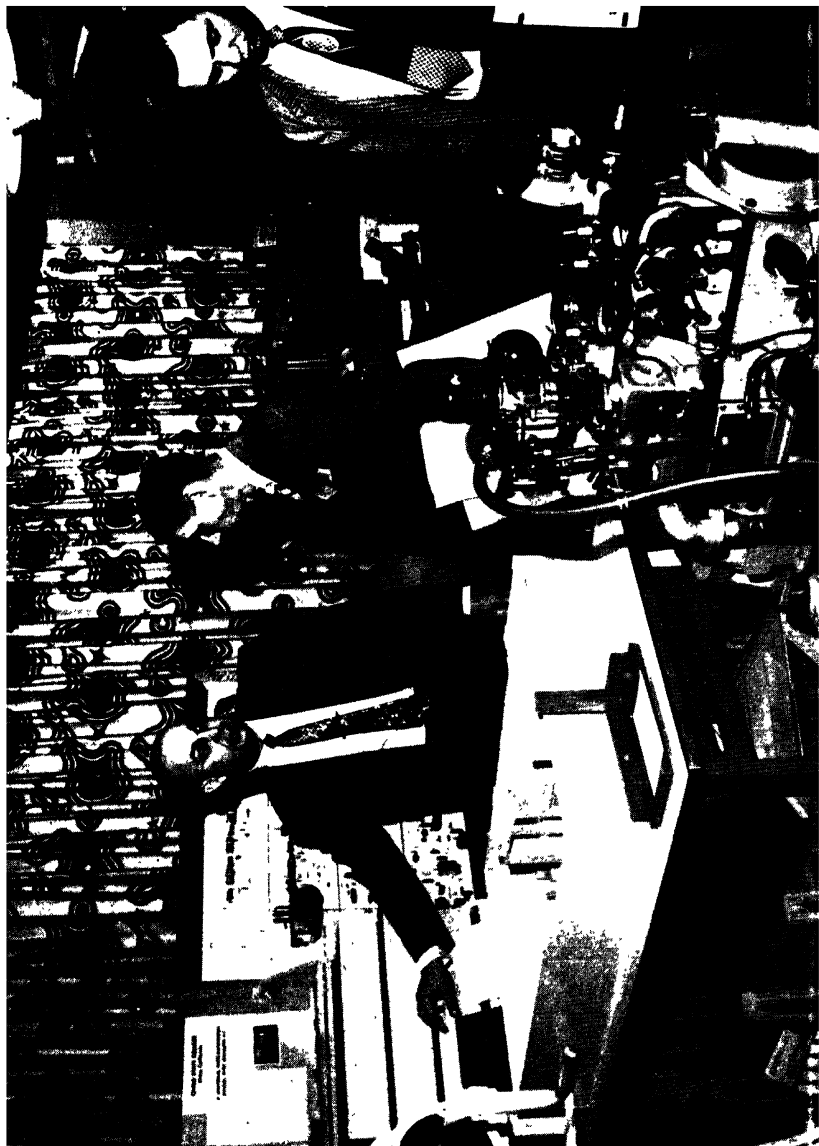
FIG. 22. Mock-up Showing Teaching Aid for Aircraft Work

FROM EXHIBITS AT AMERICAN INDUSTRIAL ARTS ASSOCIATION CONVENTION, LOS ANGELES

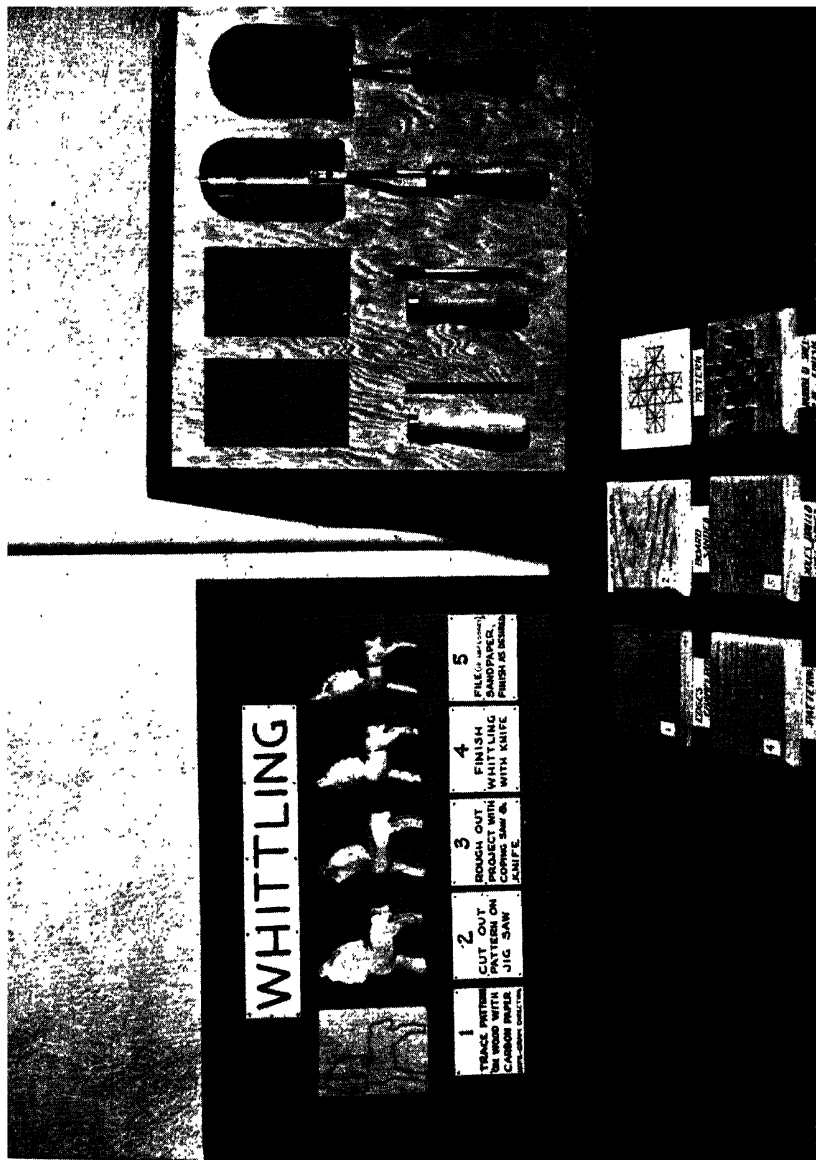
Fig. 23. Cut away equipment and sectional models constitute effective visual aids.

LOS ANGELES CITY SCHOOLS

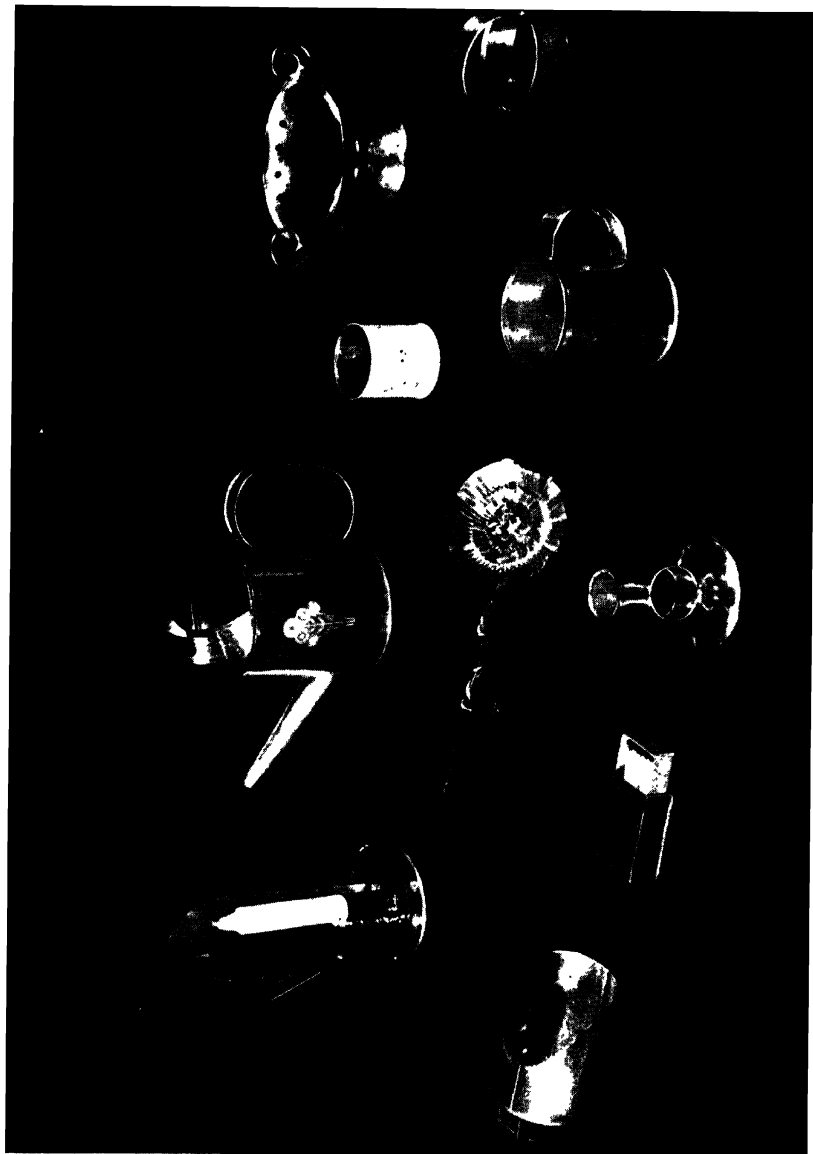
FIG. 24. Progressive steps in development of projects, displayed on boards or charts, constitute an effective aid in instruction.

LOS ANGELES CITY SCHOOLS

FIG. 25. A collection of projects will stimulate interest and challenge student effort.

7. Show by a concrete example how a textbook may be used to prepare students for a shop demonstration.

8. What proportion of time would you consider it legitimate to take for reading during class hours?

9. Make a list of ten books for either woodwork, metalwork, drawing, or automotive work that have been published in the past ten years.

10. Name some disadvantages in making assignments before the material has been covered in class by demonstration or discussion.

11. Why are reading assignments made after the topic has first been covered in class considered better pedagogy by some?

12. Make out a complete procedure sheet for showing a motion picture film on machine shop practice.

13. Make up a schedule for using a film each week in connection with woodwork in the ninth grade. Show title and sources of the films.

14. Make a list of twenty-five firms or sources from which valuable free material may be obtained as teaching aids. Name the type of material that would be expected from each source.

15. List twelve firms or sources from which educational motion films may be obtained.

16. From what sources may still films for classroom use be obtained?

17. Name five subjects in which "mock-ups" may be used to advantage.

18. What pieces of equipment can most profitably be "cut away" or sectioned for instructional purposes?

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Chapter VI

SAFETY INSTRUCTION AND ACCIDENT PREVENTION

The Importance of Safety

From the time that shopwork was first introduced in schools, the possibility of accidents has weighed heavily upon the conscientious teacher. In more recent years the moral responsibility has been augmented by a degree of legal liability, coinciding with the increasing popularity of claims for damage in connection with school accidents. Without attempting to discuss legal responsibilities, it might well be assumed that safety to the student should, and generally is, the most immediate and constant concern of the shop teacher. While the rate of accidents is probably not unduly high in most school shops, their frequency can be further reduced, and to this task every sincere teacher will dedicate himself.

Conditions Causing Accidents

All accidents in which the school or teacher may be at fault may be divided into two general classes: (1) those caused by faulty conditions of the room and the equipment and (2) those caused by inefficient instruction and management. An analysis of these general causes appears in the following:

Conditions of room and equipment which may cause accidents:

1. Low ceilings.
2. Poor light (natural and artificial).
3. Bad location of machines, causing interference between operators.

4. Failure to mark safety zones around hazardous equipment.
5. Unguarded belts.
6. Unguarded pulleys, gears, and cutters.
7. Dull tools and machines, particularly in woodwork.
8. Unguarded switches.
9. Waste and scrap stock on the floor.
10. Wrong type of clothing worn.
11. Inadequately protected stairways and ladders leading to balconies and platforms.
12. Poorly constructed stock racks holding lumber and other supplies.
13. Lack of ventilation in finishing rooms where lacquer is used, and in rooms where forging, metal casting, or similar work is done.

Inefficiency in instruction which may cause accidents:

1. Lack of teacher's knowledge of how to use tools and machines.
2. Failure to give adequate preliminary instruction.
3. Failure to follow up such instruction and to supervise the initial efforts or experiences of the students.
4. Allowing students to play in the shop.
5. Overtime work without supervision.
6. Allowing guards to be removed.
7. Failure to provide goggles and insist upon their use.
8. Allowing experimentation in the use of equipment.
9. Failure to establish proper attitudes toward the problem of accidents.
10. Failure to check the set-up of each machine before allowing operation.
11. Failure to provide for adequate ventilation.

Some of these conditions will be given further explanation in subsequent paragraphs.

Preventing Accidents

If it may be assumed that this analysis is acceptable, proceeding to check the shop and one's teaching is clearly the next thing to do. The first group of causes cannot all be remedied at once, if they exist. Low ceilings, for instance, probably cannot be raised. Machines may have to stay where they are for the present. But poor light conditions can be remedied in several ways: (1) by skylights, (2) by glass which throws light where it is wanted, and (3) by proper aid of artificial light. Light conditions have been found to have a close connection with accidents. Belt guards, guards for pulleys and gears, and general guards for machines should be first items listed for attention. If properly impressed, the administration will supply them without too much delay. Some guards can be made in the shop if no other means for obtaining them is available. The tendency to allow school-shop equipment to be more poorly guarded than that used in industrial plants should not be tolerated.

Dull Tools and Machines

Dull machines, especially in woodwork, have probably caused as much difficulty as many other causes combined. Whoever has tried to put a piece of hardwood over a dull jointer or tried to rip on a badly fitted ripsaw will realize the truth of this statement. In Chapter I, stress was laid upon the necessity for conditioning the equipment before school begins. That is a splendid step in the direction of a year free from accidents. It is, however, only a first step. It must be followed by repeated and continuous attention to all phases of the equipment, and especially to the matter of keeping all cutting tools sharp. What has been said about machines holds good also with reference to hand tools, although the consequences are usually less serious in case of accidents with the latter.

This brings up the problem of budgeting the teacher's time for keeping up the equipment. Many shops get into poor condition not because the instructor is careless but for the reason that there is no time in his program for doing the necessary work. Probably his inefficiency lies in the fact that he has not been successful in having time set aside for the upkeep of his equipment. It has been suggested previously that some teachers expect the time actually spent in class instruction to constitute their entire working day. That cannot be if the shop is to be dangerproof, to say nothing of the needs for keeping equipment in condition for efficient work. After all, it is probably much better to put in a little more overtime than to have to be in a constant state of worry regarding conditions of belts, switches, and other sources of accidents.

Everyone will agree that scraps and debris of various kinds on the floor constitute a grave danger, particularly around machines. But how many shops are absolutely free from this evil? It takes a special place for such material, and full coöperation in getting it there. Few teachers are spending enough energy on this problem to solve it and keep it solved.

Motors and Switches

When planning new equipment it should be kept in mind that individually attached motors provide for a safer source of power than line shafting and belts. It is well also to provide individual control of each machine on a wall panel where the instructor can disconnect any that is not to be used without special permission, or control any that may be out of order temporarily. Available wiring codes, obtainable through various channels, should be followed closely at all times.

Marking Work Areas

It is a good custom to mark the working space for each machine on the floor, and to allow only the operator within

the marked area while the machine is in use. Mats, made out of some nonslip material, are valuable as a support for the operator. In the absence of these, some paint or glue and fine sand may serve the same purpose. When mats are used it becomes necessary to secure all edges firmly.

Better Teaching and Fewer Accidents

The instructor is of necessity the central factor in avoiding accidents. He bears the brunt of the whole matter when accidents occur. And it is right that it should be so, even though he may at times have good reason for declaring himself hampered by the school and the board of education. Better teaching and better organization will prevent accidents. The most conscientious and able teachers have the fewest charges against them in this regard; barring, of course, cases where students seem deliberately to force accidents upon themselves.

Hazards from Overtime Work

In every shop where high interest in the work prevails, there are always requests for a chance to stay after regular school hours. Boys who ask for such privileges are usually the more reliable ones. The instructor has duties to perform outside of the room, and the worker or workers are sometimes left to their own resources. In this practice there is danger. In the first place, such work is usually done at the "peak hour" of the day, as far as liability to accidents is concerned. It has been found in industry that the larger number of accidents happen toward the close of the day.

In the second place, there is always a tendency for students to congregate after school hours whenever the shop is open; and particularly is that true as soon as the instructor goes out. Such conditions, even though irregularities are not intentional,

are likely to divert the attention of some student and an accident may thereby occur.

Exploration in the Shop

The adolescent age is one possessed of tendencies toward rebellion against rules and regulations, desire to disregard advice, to try out new schemes and methods, to do a job differently from the way the teacher says it should be done. While these tendencies have value and should be recognized in some types of work, every means must be employed to side-track them when power machinery is being operated. There are probably not many good ways of putting a board through a ripsaw, hoisting an automobile, or doing any of the standard jobs that have been determined upon after much experience. Just how to make young students see this is the problem of the instructor. Very firm steps may need to be taken to prevent dangerous experimentation just to see what might happen when using power machinery; but prevent it we must.

Impressing the Student

In giving instructions to high-school boys concerning the use of machines it is well to remember that they are used to listening to many rules and regulations. This, however, does not mean that they are in the habit of being governed by all of them. On the contrary, they are likely to be fairly expert in evading rules and "getting by." For this reason it will be of little use to make a few general suggestions and expect perfect adherence to them. Unless they have a thorough understanding of the purpose of the rules for their conduct in the use of machines, and can see how they will profit by observing them, they will probably take the same attitude toward these rules as to the numerous others pertaining to their conduct in and about the school buildings.

It is absolutely necessary that the instructor get the full co-

öperation of the students, and that they feel the responsibility of the outcome of their own actions while at work on the machines. It is the attitude of mind that prompts students to violate rules and hope to "get by" that plays havoc with them when they get into the shop or on the job.

Experience has proved the necessity of impressing the students strongly with the facts that (1) the "safety-first" rules for the shop are not arbitrary, and most of them do not profit the school or the teacher, and (2) established methods of procedure carry within them the best safety rules. To accomplish this, a statement may be made to the woodworking classes, for example, similar to the following:

You boys are accustomed to hearing many rules and regulations. There are rules for your conduct in class, for your behavior in the assembly hall and library, for your actions and language on the school grounds. Whether or not you will be penalized for violations of these rules depends, first, upon whether you are caught in the act of disobeying, and, second, upon what kind of talk you can put up to the one who catches you. The general rules of the school are flexible; they are applied somewhat according to the temperament of those who made them.

But it is not so in the use of power machinery. The most important rules here were not made arbitrarily, nor are they enforced arbitrarily. Each machine has its own rules, and the tragic part of it is that they practice no irregularity in enforcing them. The jointer says, "If you put your fingers into the knives when they are revolving, you will have them cut off just as far as they are put in!" And it never fails to make its threat good. It will not be caught turning its back or looking the other way. The ripsaw, the bandsaw, and all the rest of the machines, have similar rules and are similarly regular in their enforcement.

The electric power at the switch is never asleep on its job. It will not consider the inexperience of the beginner, and take pity on him to the extent that it fails to deliver a shock because he "did not know any better." Machines will not modify their rules according to the condition under which they were violated or who did the violating. It may be considered good sport by some

to see how many rules they can break and get by while no one is looking. Such an experiment had better not be tried with power machines.

After this sort of presentation, which, of course, should be made kindly and sympathetically, the class is usually ready to listen to demonstrations in the actual use of the machines. As soon as the boys see that this is done for their safety and efficiency, the goal is reached. The degree of success of the first lesson is a fair index of the remaining job resting upon the teacher. It may, and probably will, take several lessons before the ideal is reached or even approached, but a beginning toward this ideal must be made at once.

Value of Danger Signs

The use of charts and signs calling attention to dangers in use of machines, or stating rules to be followed, appears to be of value only up to a certain point. Too many such signs become commonplace and lose their value. They should not be depended upon, for after they have been in place for a while they are not noticed. Whatever subconscious effect they might have is probably of questionable value. To clutter the shop with large, unsightly signs of this nature probably does more harm than good.

Additional Suggestions

The following additional suggestions to the instructor may be of value:

1. *Know the state laws.* The instructor should make himself fully familiar with laws of his state covering the guarding of machines, and any other phase of legal ordinances that may affect his work. All rules for guarding machines may not apply to schools, but it is well to have the school shop conform in full to all regulations that can be put into practice.

Such procedure may eliminate embarrassing situations at a later date. Neither should the instructor feel that he has made a gain if the state inspector should fail to visit his shop. It is better to call for him, and to follow his recommendations.

2. *Know safety-instruction materials.* Much printed material bearing upon safety in school activities has become available in recent years. Chief among sources for such material is the National Safety Council,[1] from which various suggestions and outlines for safety programs may be obtained. The bulletin entitled "Safety Education for the School Shop" is of special value for teachers and supervisors of shopwork. State departments of education will either have material of this type for distribution. or will be in position to refer the inquirer to suitable sources. Many school systems in larger cities have published extensive safety rules and suggestions for local use.

The teacher should familiarize himself not only with state laws covering safety practices, but should also obtain all available suggestions for training pupils in safety habits both in and out of school. Written material on safety should be available to students in the school for the reason that published instructions will seem more factual and authoritative than oral instructions given by the teacher. Available references for safety instruction are listed at the close of this chapter.

3. *Check student's work.* Get the habit of checking every set-up of every machine before permission to start the machine is granted. This will often be the means of arresting many an awkward situation.

4. *Check unreliable students.* Some students who may come to the shop are not capable of handling a machine intelligently. Some will never learn. Often such students can talk well and give a false impression of their ability.

5. *Check up prerequisites.* It is well not to take students'

[1] National Safety Council, 425 North Michigan Ave. Chicago, Ill.

words for what they can do. Definite prerequisites should be set up before students may work on the machines. Sometimes an irregular student comes with the group and is not noticed until his lack of experience gets him into difficulty.

6. *Practice constant supervision.* It has been suggested previously that announcements regarding safe practices are not enough. Constant supervision is needed to be sure that exceptions are not allowed to creep in. The use of a safety foreman or "engineer" in the class organization, as discussed elsewhere, is helpful in impressing students with needs for safety practice.

Fear as a Danger

It is possible that while an instructor must make a strong impression on some in order to make them sufficiently cautious, there are a few who are overimpressed with the dangers and become inhibited in their actions. If this is the condition, such students must be released from their complex or their caution constitutes a danger. Skillful demonstrations by the teacher will help to overcome the difficulty. The best remedy is probably some quantity job on a machine such as ripping a large number of boards, or some similar piece of work, that will make the person gain confidence in the fact that the machine in itself is not dangerous when properly handled. A sympathetic understanding between students and instructor is helpful at all times.

Means for Protecting Teacher, Pupil, and School

Even after all steps have been taken for accident prevention, it is still wise to think of the possibility of accidents, and to be prepared for such possibilities. The teacher, the pupil, and the school must all be considered. The teacher wishes to protect himself against legal responsibility even though he has satisfied his moral responsibility through efficient planning and

teaching. The safeguarding of children, instructor, and school, in this connection, may reach out in the following directions:

1. *Provide insurance.* Some boards of education have purchased blanket insurance covering all types of accidents that may occur while children are legally charges of the school.

2. *Permission from parents.* In many school shops it is the practice to request the parent or guardian to sign a permit for the student to use machines in shopwork, and also to declare that he will not hold the school responsible for accidents that may occur. While such a statement still may not legally release the board of education from responsibility, it would make the parent more hesitant to claim damages.

3. *Have first-aid kit.* Every shop should be provided with adequate first-aid material. Antiseptics, bandages, and other simple preparations should always be available for taking care of smaller wounds, and for caring for more severe cases until medical aid can be had.

4. *Have students pass safety tests.* A recommended practice for proving that proper instruction has been given in regard to use of power equipment and in tool manipulations is to give written tests to the students. The procedure in these tests is such that the student puts down in writing the safety rules covering each piece of equipment and writes out steps for doing jobs on the various machines. These written test papers are then put in the files of the principal or the board of education and kept there until the student attains the age when he and his parents have forfeited their rights to bring lawsuits for injuries that he might have sustained in school.

5. *Knowledge of first aid.* Every teacher owes it to himself and his students to know the elements of first aid to injured persons. With such knowledge he can safeguard students in severe cases of bleeding or shock. Most cities now offer courses in such work under the auspices of the Red Cross or some other agency, and all instructors who have not the needed

knowledge and skill in this regard should acquire such knowledge and skill without delay. Small wounds or scratches should always receive treatment and be reported through regular channels usually provided for by the school.

General Safety Education through Industrial Arts

It would seem reasonable to expect that every teacher in elementary and secondary schools should accept the responsibility of giving safety instruction and developing safety consciousness in students. In the industrial-arts shop and laboratory, superior opportunities for such instruction present themselves because the nature of the work and the type of materials and equipment used more nearly parallel conditions in the home under which accidents occur. While the amount of time that should be devoted separately to general safety instruction may be a debatable question, it still remains that in the industrial-arts setting, safety practices for the home can best be stressed in connection with the use and handling of such materials as acid, inflammable substances, paints and finishes, electrical appliances, fire, slippery floors, etc. Not much time needs to be used in calling attention to the application of these dangers to home conditions, since most of them must be discussed in the course of the work in school.

PROBLEMS AND QUESTIONS

1. Make a complete check of safety conditions in a school shop, and write a report that might be given to the administration.
2. How may safety signs in the school shop be effectively used?
3. Make a list of the most common causes of accidents in the school shop.
4. What are some of the means by which the instructor can interest the school board in spending money for adequate safety appliances in the shop?

5. Make a form for use in checking safety conditions in a school shop.

6. In what type of commercial shops do most accidents occur?

7. Is the answer to question 6 also true for school shops?

8. What should be the instructor's attitude toward keeping the shop open after school hours?

9. Does the fact that the instructor has had extensive experience in industry always mean that he will prevent accidents among his students? Show in detail in what respects he would or would not do so.

10. To what extent are the schools of your state responsible for children outside of the classrooms?

11. Is there any need in the school shop for considering fatigue as a possible cause for accidents? Explain.

12. Show how a lack of coöperative attitude on the student's part may be a cause for accidents.

13. Make out a form that you would send out for parents' signatures before students would be permitted to use machines.

14. If children are taken out for observation trips into industry, what is the teacher's responsibility for accidents that may occur?

15. Make up a list of safety rules for a woodworking shop, or an electric shop.

16. In what ways may an instructor protect himself legally against liability in connection with shop accidents?

17. Has there been a decline or increase in accidents in school shops in the past decade?

18. What agency in your State enforces safety codes in industry?

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Chapter VII

GENERAL EDUCATION THROUGH INDUSTRIAL ARTS

Non-Manipulative Aspects of Industrial Arts

From the time of its inception as a school program industrial arts work has placed emphasis upon tool operations and manipulative experience. "Learning by doing" was a slogan used in advocating this new subject as a part of the curriculum of both elementary and secondary schools. But while this slogan is still applicable, the concept of putting it into practice has grown greatly in scope and comprehension. One result of this growth is increased emphasis upon a broadening of opportunities for experience and learning in the program of industrial arts. This broadened concept of the place and function of industrial arts has led to a common agreement that industrial arts is an integral part of general education. And on the basis of this agreement, the program of industrial arts can well be further developed and enriched. Some aspects of this development are elaborated upon in succeeding paragraphs. It should be kept in mind that these aspects are segregated for the purpose of discussion only. It should not be implied that all the elements discussed should be thought of as necessitating separate units for instruction.

Related Information and Study

The informational content thought to be desirable in connection with industrial arts has often been classified as "related information," or "items of knowledge." These items may again be divided into "directly related," and more "remotely related" to the manipulative work carried on in the class.

Typical items directly related might have to do with reading drawings, knowledge of types and quality of tools, characteristics and relative costs of materials, principles of mathematics and science necessary for successful work. This type of knowledge is essential to efficient work. It has always been stressed to some degree in shop instruction.

The second type of related knowledge is a later addition to the program. Here the concern is about learnings that increase mechanical intelligence and technical knowledge, such as how steel is made, how lumber is produced, styles of furniture, composition of alloys, and similar items. This information may not be essential for the performance of the required work, but it is, nevertheless, valuable in developing a broader understanding of the craft and a pride in the work performed.

The Aesthetic Phase

There is good reason for believing that appreciation in the arts is best brought about through some degree of participation. Appreciation for good design and ability to use discrimination in the selection of consumer goods can undoubtedly be stimulated in industrial arts, provided that the teacher himself has had the necessary preparation in this area and is impressed with the values of stressing these elements of instruction in his program. Here, as in connection with other phases of coördinated study and discussion, two approaches are available to the teacher: (1) making constant application of principles of beauty and good taste in connection with all articles made, and (2) setting aside time for deliberate study and discussion of such principles, drawing upon visual aids and other means for examples that may be analyzed. See Fig. 26. Reference material for use in the shop and to take out for reading would be a necessary facility in the program, and so would also be coördination with the art department.

Understanding Industry

Understanding of industry and of the industrial society basic to American life has come to be an accepted goal for industrial arts. While this goal is undoubtedly shared by many subject-matter areas in our schools, industrial arts should offer unique opportunities for contribution to its attainment. If the teacher is impressed with the value of this goal, he will find many opportunities to do more than give lip service to it. Organization in industry can be illustrated and simulated through student participation in shop management. Production jobs will call for cooperative effort and managerial organization. It should be kept in mind, however, that it is necessary to make definite comparisons to industry and to enlarge the vision of the students by additional means, such as field trips, motion pictures, available reading material, etc., in order to get the most value out of the experiences given in school. It should not be assumed that young students will automatically relate their experiences to remote situations without having points of similarity and application emphasized.

Another aspect of this discussion is the impact made by our technological age upon the pattern of modern social and economic life. The rapid advance in mechanization, technology, and automation is making it essential that an attempt be made seriously in school to assist students to adjust themselves to adult life in a new and rapidly changing order of things. The impact of these conditions is widely publicized and need not be repeated here. A program for learning to work and live under this rapidly changing environment can well be thought of as a challenge to our schools and to society at large. This challenge faces the industrial arts teacher and his program and calls for more than a perfunctory response.

Personal Development

Growth and development of the pupil has long been a major

consideration in general education. To assist the student to become a happy, useful, and successful citizen has been a goal of industrial arts. See Fig. 27. Again industrial arts has a unique opportunity to make a contribution in this category, and for two reasons: (1) because of the type of subject matter involved, and (2) because of the close personal contact that automatically exists between teacher and student. These conditions do not in themselves necessarily produce desired results, however. While one reason for the popularity of industrial arts is probably the close relationship between student and teacher, there is still danger that maximum advantage is not taken of opportunities that exist. We have talked about developing habits of neatness and order, reliability, consideration for others, cooperation, industry, etc. There is no doubt that the very atmosphere of an orderly shop is a setting for the development of such traits. But let us not assume that they will come into fruition automatically without constant planning and supervision. For a rating scale applying to such characteristics see Chapter VIII.

Occupational Study and Information

Assisting youth to learn about occupational opportunities has become an accepted responsibility of the school. And here, again, the industrial arts program is accepting its share of the challenge and is in a favored position to meet it. Two approaches to the problem are suitable and available: (1) occupational exploration through the regular shop activity, and (2) occupational information and study through varied auxiliary means.

The first of these is relatively obvious. Students who take a varied program in industrial arts have the opportunity to experience first hand at least some of the basic contacts with tools, materials, and operations pertaining to the occupations represented. But the instructor's opportunity does not end

with the practical work at the bench or at the machine. There is much valuable information about the occupation represented, and about related occupations, that will not come into the student's possession through the limited amount of manipulative work which is possible in the school. It is the duty of the instructor to analyze such informational material, and to select from it such phases for presentation as will help the student not only to make a more intelligent, future occupational choice, but also to learn about many aspects of the technological society in which he lives.

Procedures in Studying General and Occupational Information

Information, whether for the purpose of enriching the general course content or for giving an insight into occupations, may be given to students in a number of ways. The methods of procedure and sources of information are here discussed simultaneously for both types of approach, since not only does the subject matter often suit both purposes, but the methods of selection and presentation are identical in a large number of cases. The following means have been used successfully:

1. Presentations by the instructor.
2. Study assignments and student reports.
3. Talks by men from industry and business.
4. Visits to industry.
5. Motion pictures and other films.

1. *Presentations by the instructor.* The method nearest at hand, but in many ways also the least effective, is for the instructor to give the class orally the information which he thinks they need about the work or about the occupation. There are topics of this type, no doubt, for which this is the most desirable method. But, in general, the instructor's voice becomes rather customary, and other methods of approach are more desirable and produce a more permanent effect.

2. *Assigned study and student reports.* If the shop library is at all complete, it should have in it some good books on occupations. To such books, students may be directed for valuable information and for brief oral and written reports. Study of occupational information in this way has a distinct advantage in that it enables students to cover more ground than can be covered by class presentations alone. Government bulletins and pamphlets published by other agencies are available for this study program.

3. *Presentations by outside speakers.* A series of talks by outstanding men in the field of occupations under consideration has been resorted to in various schools. This type of approach creates interest among students, particularly until it becomes commonplace. Extreme care must be exercised in selecting the persons who assist in such a program, or it may result both in waste of time and in unfortunate reactions on the part of the students. Even with the best selections possible, it is necessary to impress such speakers beforehand with both the purpose for the arrangement and the most effective procedure in the presentation. A definite outline for studying and presenting an occupation is of value in the hands of such persons as a basis for preparation of a valuable talk.

4. *Visits to industries.* Well-organized visits to industrial plants, buildings under construction, drafting rooms, and other places where the world's work is being done are valuable in broadening the students' views of occupations and their possibilities, as well as their understanding of the impact of industry upon present social and economic life. Next to actual participation in the occupation, this method is probably the most effective for obtaining a fairly true picture of the work of an occupation and the conditions under which the work is done. Figs 28 and 29 picture an organized visit to a manufacturing plant.

To be most effective, such visits must be planned for in ad-

vance. The instructor should first visit the plant personally, and note for himself just what phases of the work will be most valuable. He might next make out a form for the students to fill in with the information gathered in their visit. Unless the class knows beforehand what they should look for, there is danger that the trip will mean little but a holiday.

5. *Motion pictures as occupational information.* Some prefer motion pictures to any other means available for studying occupations. Even if the numerous difficulties in the way of industrial visits were eliminated, it is argued that pictures are preferable, and for this the following reasons have been given:

a. The program can proceed without interfering with the schedule of students with reference to other studies. This cannot well be done when visiting industries, because the period usually devoted to the class is not of sufficient length.

b. The attention of students can be concentrated more easily upon the subject at hand. On a visiting trip there are always competing attractions taking away the emphasis from the important points.

c. It is rarely possible for all students on a visiting trip to get near enough to important phases of the work which may be in progress to take with them a true picture of the conditions that actually exist.

d. Oral explanations which are given in connection with motion pictures can easily be heard, which is not so in the average visit to industrial plants.

e. Motion pictures can often be slowed down, or suspended where necessary, for further study of details.

While these advantages are worthy of consideration, it can hardly be agreed that pictures are in every respect more desirable than actual visitation. In most localities there would be no pictures available of the larger number of local industries in which students of the schools might expect to enter. Even in the largest cities only a few of the most important industrial

plants can furnish films showing the scope of activity engaged in, and, even when such films are produced, advertising qualities rather than true occupational conditions may have been given first consideration.

Motion pictures, as well as many other types of audio-visual-education material, do have a definite place in the program of modern industrial-arts teaching. While the customary use of films is thought of as pertaining to occupational and related information, there are valuable films available for giving instruction in manipulative processes as well.

Outline for Evaluating Occupations

In the study of an occupation, whether it be through any one or all of the methods suggested in this chapter, the instructor must have an organized plan for arriving at the information that will be of greatest value to the students. The outline which follows has been used to indicate the type of analysis desirable for such an outline. It is equally valuable for use where the study is made as an auxiliary to the industrial-arts program, or where the study of occupations has been organized independently on a broader basis.

OUTLINE FOR THE STUDY OF AN OCCUPATION

I. *General statement concerning the vocation:*
   1. Value of the vocation as a social service.
   2. Duties of one engaged in it.
   3. Number engaged in it in local community.
   4. Relative number engaged in it, in general, with its probable future development.
   5. Relative capital invested in it.

II. *Personal qualities demanded:*
   1. Qualities of manner, temperament, character.
   2. Mental characteristics.
   3. Physical demands.

III. *Preparation required:*

1. General education.
2. Special or vocational education.
3. Apprenticeship conditions.
4. Experience required.

IV. *Wages earned by workers:*
1. Range of wages made (table showing distribution of cases).
2. Average wage per week.
3. Relation of wage to length of experience and preparation.

V. *Length of working season, working week, working day.*

VI. *Health of the workers:*
1. Healthful or unhealthful conditions.
2. Dangers, accidents, or risks.

VII. *Opportunities for employment:*
1. In local community.
2. In general.

VIII. *Organization of the industry*, including the relations of the worker to his fellow workers, his employers, and to the community.

IX. *Status of workers:*
1. Opportunities for advancement.
2. Time for recreation and enjoyment.
3. Adequate income for recreation and the comforts of life.
4. Any other items of peculiar interest in this connection.

X. *Biographies of leaders in the vocation.*

How Much Industrial and General Information?

With all that has been said of the value and importance of general and occupational information in this chapter, there is no intention of suggesting that an undue amount of time be spent on this phase of the work in an industrial-arts program. Shopwork in the school is essentially manipulative in character, and it should not be made into a discussion subject of the

academic type. But to narrow the shopwork down to the bare, manipulative processes is to limit it in educational and exploratory values.

As a definite suggestion, the opinion is registered here that if the subject of industrial arts is to claim to be of educational value parallel to other subjects in secondary schools, from 20% to 30% of the total time of the class period may be needed for other than actual toolwork. This takes in consideration all the activities such as roll call, tool checking, cleaning up, etc., as well as demonstrations, discussions, reports, and occupational information. On the other hand, if the time so used exceeds 50% of the time, there is probably danger that the values of the subject as an activity are being minimized and that it might be difficult to maintain interest in the long run.

A Balanced Program

The suggestion in the previous paragraph regarding allocation of time should not be construed as an indication that general education values are not present in connection with tool operations and construction work as well as by direct teaching and investigation. On the contrary, the effectiveness of industrial arts as general education becomes tangible and measurable to a great degree through the operational phases of the program. Under sympathetic supervision of the teacher, the work periods will become a laboratory setting for the practice and application of facts, principles, and information learned and discussed.

Personal growth, leading toward desirable work habits, social maturity, proper attitude toward others, self-discipline, and willingness to accept responsibility make a constant major goal before the conscientious industrial-arts teacher. With this overall goal in mind, the teacher will then carefully plan all of the instructional program toward its attainment and the various aspects of student activity will contribute to the same end.

PROBLEMS AND QUESTIONS

1. How would you proceed to analyze a given course of study for a better balance between manipulative and non-manipulative work?
2. List a series of presentations or class discussions which emphasize the "aesthetic phase" of industrial arts.
3. How could class projects be selected stressing opportunities for "understanding industry"?
4. In what ways might usual teaching procedures be reorganized to place emphasis upon personal development of the student of junior high-school age?
5. At what age do you believe that pupils should be urged to make the selection of their life's work?
6. How permanent do you consider occupational choices which are made by boys fifteen years of age or less?
7. List in detail the steps of procedure which a teacher might follow in arranging for an occupational visit with his class.
8. In what respects, if any, are industrial visits superior to motion pictures for imparting occupational information?
9. Make up a sheet of information and suggestions which one might give to the class before going on an industrial visit.
10. Make an outline for the students to follow in their reports of industrial visits.
11. How would you go about preparing an outside person for giving a talk on his occupation before a class of fourteen-year-old boys?
12. Is there, in your opinion, danger in being too explicit in suggestions to one who is to speak to a group of school boys? If so, what is the danger?
13. What are some advantages in having students find and present occupational information rather than having the teacher do it?

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Chapter VIII

EVALUATING AND RECORDING STUDENT ACHIEVEMENT

Reasons for Evaluating Student Progress

Procedures pertaining to evaluating and measuring student progress have come to be an increasingly important part of the work of every teacher. In keeping with the growing feeling of need for checking results of teaching, a considerable variety of instruments and techniques for evaluation have been developed within recent times. A number of generally accepted purposes and values in measuring student progress are discussed briefly in the following paragraphs. In the selection of these, the values applying to teaching have been kept in the forefront, rather than administrative, supervisory, and curricular applications.

1. *Ascertain rate of learning.* Suitable use of evaluative means and procedures will assist the teacher in learning to what extent the student is mastering the instructional material presented. The value here indicated is, of course, largely dependent upon the use which the teacher makes of the results of such tests in his work. When, in addition, there are available in the central office cumulative records based upon various tests and previous accomplishments, the teacher can throw further light upon his own test results.

2. *Discover learning difficulties.* All teachers will acknowledge that there is a great degree of individual difference among students. But how to become aware of the nature of such differences and be able to give definite assistance where needed is an ever-present concern of the conscientious teacher. Learning

difficulties among students in industrial arts may be caused by many factors, among which are: (a) lack of general scholastic intelligence (I.Q.), (b) lack of previous experience, (c) wrong attitude toward the work, (d) social maladjustment, (e) inadequate instructional materials, (f) faulty instruction, and many others. Careful use of standard evaluative devices and teacher-made short answer tests should assist in analysis of obstacles and also indicate to the teacher and other personnel some possible remedies.

3. *Motivate students.* Tests, well selected or constructed and informally used, undoubtedly help greatly to create and maintain interest in learning. In industrial arts, and in other subjects as well, a large variety of approaches may be made in which students will participate with pleasure. Student participation in marking scores, or giving tests, or arranging students in competing groups, indicates variations that might stimulate interest. Arranging the class into two teams for tool identification with some recognition for winning the high score has proved stimulating. The best motivation is likely to result when scores do not affect permanent marks.

4. *Selection and classification of students.* This value may appear to be applicable to administrative and general guidance procedure rather than to the classroom. It has obvious application, however, to the teaching situations in industrial arts. Tests of various kinds can be used to check incoming groups for specified prerequisites for advanced courses; as well as for selection of foremen, tool clerks, and other student personnel for participation in class management. Such analysis is also valuable for grouping classes for various types of work on class projects or group production.

5. *To measure teaching efficiency.* Who is the teacher that has not had the experience of thinking that he has taught one thing and later found that the students, or some students, at least, apparently learned something else; or didn't learn at all?

Frequent use of tests, selected or constructed to measure specifically the items one attempted to teach will reveal to what extent the teaching has been effective. And, incidentally, the teacher should be stimulated to do better planning of his material and perhaps review the thirteen points for a successful demonstration in Chapter II before making his next presentation to his class.

6. *Re-evaluate course content.* Presumably every industrial arts teacher has a written course of study for each course he teaches, either made by himself or adapted from some other source. From whatever source it comes, it will need constant analysis and re-evaluation. If a testing program is carried out, such evaluation will come about in two ways: In the first place, if the teacher makes up his own informal tests, which he should probably do for the most part, he will of necessity be forced to refer to his objectives and his course outline for validity of his questions. This will cause him to re-examine his course of study in the light of his teaching. In the second place, the results of the process of measuring achievement on the part of students may point to the need for revision of the course to suit the various factors present in the teaching situation, as age, ability and interest of students, equipment available, time factors, and overall concepts by the administration.

7. *Establish and maintain standards.* A program for evaluation will necessarily require that definite requirements be established which will be used as points for measuring achievement. In older traditional subjects such as mathematics, English, history, etc., standard achievement tests have long been relied upon to indicate acceptable accomplishment or attainment of standards or for comparison with average national norms. While standard achievement tests are less numerous for industrial arts, some valuable standardized instruments are available. Further research should contribute more valuable material. But in spite of the lack of accepted standardized

tests in many areas, the use of tests and evaluations will directly or indirectly contribute to the setting up of standards of attainment in industrial-arts class programs. The growing volume of literature within the field, the exchange of ideas within the profession, publications by professional organizations, state and local boards of education, and other groups and committees have contributed to a body of content upon which the teacher can build reasonable standards, adjusted as they might well be to his local situation. An important factor here is that as the teacher accumulates suitable tests and other evaluating instruments for his teaching he will by the same process unify his standards and maintain them for all similar classes taught.

8. *Make teaching objective.* The stress upon evaluation and measurements in teaching indicates basically the objective approach. However, the subjective approach has been traditional with the teaching profession. While subjective reactions cannot, and probably should not if they could, be eliminated in connection with evaluations of student achievement, the objective approach is now widely emphasized and relied upon. More is involved in this concept than reliance on objective tests in teaching, although admittedly that is the major element involved. The teacher who acquaints himself with objective evaluative material will find more and more uses for it in his teaching. The construction of various types of short answer tests and their uses, developing methods of scoring, and similar activities will no doubt lead to a general objective approach in connection with other phases of teaching such as wording of questions in class discussions, assignment of written work, and selection of vocabulary in class discussions and demonstrations.

9. *Basis for marks and ratings.* Obviously a new basis for giving marks to students will be the result of an extensive use of short answer tests and similar means. The faults incidental

LOS ANGELES CITY SCHOOLS

FIG. 26. Opportunity for participation under guidance should lead to intelligent appreciation of composition and craftsmanship.

KANSAS CITY, MISSOURI, PUBLIC SCHOOLS

FIG. 27. Participation in a toy-making project for children in hospitals should develop civic mindedness and feeling of social responsibility.

LOS ANGELES CITY SCHOOLS

Fig. 28. Well-organized visits to manufacturing industries give first-hand knowledge of methods of production as well as of occupational distribution and opportunities.

LOS ANGELES CITY SCHOOLS

Fig. 29. A "Boys' Day in Industry" offers opportunities for visiting plants under expert guidance.

SANTA BARBARA CITY SCHOOLS

FIG. 30. Frequent informal objective tests constitute a valuable teaching device as well as a means for evaluating teaching efficiency.

SANTA BARBARA CITY SCHOOLS

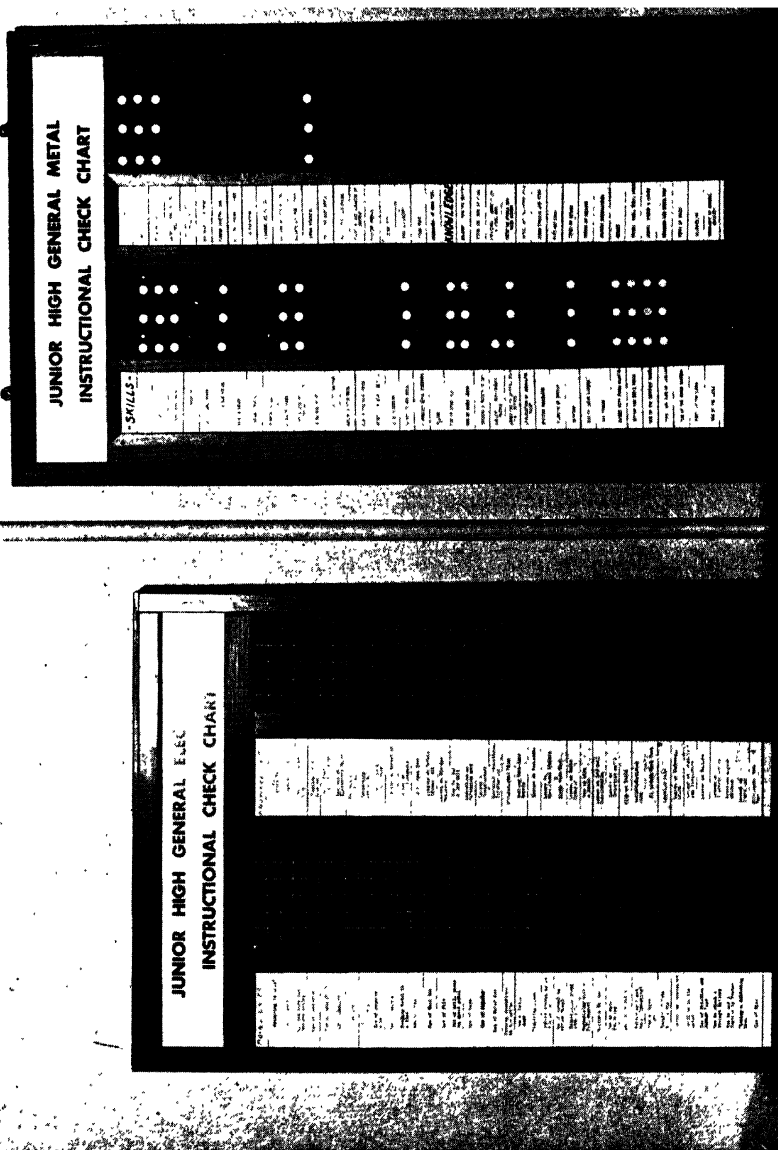
FIG. 31. Responses to object tests may be of two types: (1) writing the names of numbered objects on cards or paper; (2) matching the number of the object with the appropriate name already furnished on the paper.

LOS ANGELES CITY SCHOOLS

FIG. 32. Check charts of this type will enable the teacher to keep a record of teaching units presented to various classes.

LOS ANGELES CITY SCHOOLS

FIG. 33. A teaching aid which will enable students to test their own knowledge of resistors.

to basing marks solely upon subjective personal reactions and essay examinations are too well known to need reviewing. On the other hand, objective tests when used as the basis for establishing marks need to be closely examined for true objectivity. This aspect is further discussed later in this chapter. Essay test questions can be so constructed that a larger degree of objectivity can be practiced when evaluating answers than is usually the case. If the concept of objective handling of the whole matter of tests and examinations is appreciated by the teacher, all tests can at least be "bent" in the direction of objectivity. And let us not forget that many so-called objective teacher-made tests may lack much in being worthy of that name.

10. *Basis for student guidance.* A number of tests have been developed especially for student guidance. Some of these have been standardized. They cover various fields of aptitudes as, mechanical aptitude, occupational interests, musical aptitudes, clerical aptitudes, etc. These are generally given by guidance personnel, educational institutions, and vocational guidance counselors, as well as teachers. This does not, however, exclude the industrial arts teacher from finding applications to guidance in his testing program in the shop. Occupational aptitudes would certainly be indicated in results from standard and informal tests given in industrial arts courses. The teacher will do well to study these results and assist his students to discover occupational and educational interests on the basis of test scores and other evidence of aptitudes and abilities. Complete records of such evidences will help him to assist students in later years, sometimes many years after the student leaves the school.

11. *Basis for research.* The techniques used in a good system of evaluation of students can often contribute to much needed research in the field of industrial arts. While procedures and time consumption in connection with larger research

projects are usually too demanding for a full-time teacher, there may well be minor units that can either be handled by a single teacher or in cooperation with others in the profession. Students in graduate schools often solicit the opportunity of making investigations, part of which can be carried out in school shops. Among such projects might be, "A Study of the Value of Prerequisites for Industrial Arts Classes," "The Advantage of Requiring Mechanical Drawing before Manipulative Shop Work," "Where Is the Point of Diminishing Returns in Length of Periods in Industrial Arts in High Schools," and many others.

The values and outcomes pertaining to the practice of measuring student progress discussed so far can, of course, be augmented and further analyzed. Those mentioned should be sufficient to emphasize the importance of this phase of the teaching process and should, it is hoped, stimulate teachers of industrial arts in particular to take greater advantage of available means and methods for employing evaluative techniques and procedures in connection with their teaching and correlation of work with other staff members.

Types of Tests and Measuring Instruments

In order that the teacher may be able to carry out a suitable program of evaluation in his particular area or subject of instruction he would normally be interested in the variety of programs and practices in the use of tests and measurements as well as instruments and techniques involved. Hence it would seem appropriate here to enumerate and characterize the major types of tests and evaluating devices which are likely to be a part of a total program of personnel work or instruction in a school system; or used in industry and occupational life. In the light of the chief purposes of the discussion in this chapter, as previously indicated, only a limited treatment of the most significant items involved can be given attention.

Scholastic Aptitude (General Intelligence) Tests

The terms "general intelligence" and "intelligence tests" have now been familiar ones in educational circles for at least a half century.[1] Now the "I.Q." (Intelligence Quotient) is probably in the vocabulary of most secondary school students with at least a general conception of what it implies. With the passing of time, tests and testing procedures for this mental quality have been expanded and refined. The purpose of these tests is to discover a person's ability to learn to think abstractly, to reason well, to adapt to new situations. Criticism has been levied against the term "intelligence" in this connection under the claim that the content of test items is closely based upon requirements for success in school as traditionally organized and operated and that the interpretation of the test scores should not be applied freely to indications of success in occupational life or in life outside of school. On this basis "scholastic aptitude" has become an accepted term which probably more closely indicates what is measured. Mental tests are now given at intervals to all children in elementary and secondary schools. The testing leads to the establishing of the child's "mental age," and the final intelligence quotient (I.Q.) comes from the relationship of his mental age (M.A.) to his chronological age (C.A.). The formula used is $\frac{\text{M.A. (in months)}}{\text{C.A. (in months)}} \times 100 = \text{I.Q.}$ An I.Q. of 100 indicates average ability of unselected students. Presumably there are as many students with a rating below 100 as above.

Some interesting studies have been made of I.Q. ratings in relation to success in different subjects. Some of these have indicated that success in subject areas such as industrial arts, art, music, and athletics may not require as high an I.Q. as for some of the so-called academic subjects. This may be true

[1] Alfred Binet in France published the first general intelligence test in 1905.

partly for the reason previously referred to that the tests upon which the I.Q. is based used content basic to the traditional curriculum in the schools. Whatever deductions may be drawn from such data, it cannot be concluded that all low I.Q. students will be successful in industrial arts or that all students with high I.Q.'s would find this type of work distasteful or uninteresting. Other investigations made would tend to indicate that there is a low positive correlation between I.Q. and success in shopwork. Nevertheless, the I.Q. ratings of students are valuable to the teacher of industrial arts. Used intelligently they should assist the teacher to interpret student behavior in the shop or classroom.

We all realize that measuring scholastic aptitude is difficult, because of the abstract values involved. The I.Q. formula, at least, attempted to recognize the significance of mental alertness and resourcefulness.

A number of intelligence tests of more recent origin have eliminated the use of the I.Q. concept entirely. Intelligence is measured in terms of factors, and the relative degree to which the student responds to each factor is then expressed in terms of percentile ranks. One such test of intelligence, the *Primary Mental Abilities Test*,[2] measures six mental abilities. These are: Verbal Meaning, Space, Number, Memory, Word Fluency, and Reasoning. In a subject like industrial arts, students tend to do better with higher ratings in the factors of Space, Number, and Reasoning. The factors associated with verbal facility, although desirable, appear to be less important for basic success in industrial arts. Further research needs to be done in order to determine what mental factors are required for success in the various subjects covered by the general field of industrial arts. But, it is not difficult to imagine that eventually the use of these newer tests of intelligence will furnish improved data that will assist counselors and teachers to direct

[2] Published by Science Research Associates.

our students better into areas of schoolwork where they will find their greatest satisfactions and success.

Special Aptitude Tests

Special aptitude tests are instruments used for predicting success in segregated segments of the school program or in occupational life. Another value of these tests is that they will stimulate a process of self-evaluation on the part of those who take them. They are of later origin than the general mental tests. Tests of this type are available for many special areas such as music, art, language, manual dexterity, clerical work, and many others. Another type of test within this area of aptitudes attempts to analyze more general success qualities for larger areas of occupational grouping or for social and personality qualities related to areas of employment. As related to the industrial arts program, two general classes of these tests might deserve further comments: namely, mechanical aptitude tests and occupational interest inventories.

Mechanical Aptitude Tests

The purpose of mechanical aptitude tests is to measure the degree of natural mechanical ability or aptitude possessed by an individual. Comparisons can then be made to requirements in a specific occupation or a group of possible future occupations. School study programs leading to basic preparation for such occupations or occupational fields may then be arranged. A variety of forms are available. While here, as in the case of general scholastic tests (perhaps even more so), it appears difficult to segregate past experience from native aptitude, these tests will contribute in the effort of assisting individuals in selecting future school programs and occupations. Typical instruments for measuring mechanical aptitudes are:

Bennett, G. C. *Mechanical Comprehension.* A test for measuring understanding of various kinds of mechanical devices and resulting forces from

mechanical operations. Involves principles of pulleys, levers, weights, friction, power transmission, etc. The Psychological Corporation.

Purdue Research Foundation. *Purdue Pegboard.* A test for manipulative dexterity involving gross movements of arms, hands, and fingers, as well as finger dexterity in small assembly work. Science Research Associates.

Patterson, D. G., Elliott, R. M., Anderson, L. D., Toops, H. A., and Heidbreder, E. *Minnesota Spatial Relations.* A test involving placing variously shaped blocks into appropriate holes in form boards, measuring speed and accuracy. Grade norms available for boys 7 to 12, and also for the college age.

O'Rourke, L. J. *Mechanical Aptitude Test, Form A.* A test based upon recognition of hand tools and tool usage, plus a series of objective tests covering use of tools and industrial materials. The Psychological Institute.

Ziegler, W. A. *Minnesota Rate of Manipulation Test.* This is a test for measuring dexterity in movement of fingers and coordinated movement of both hands. It is intended for use in selecting office or shop workers and can presumably also be used for discovering aptitudes and native abilities leading toward future occupational success.

Occupational Interest Inventories

Occupational interest tests or interest inventories differ from mechanical aptitude tests in that the approach is that of personal reactions and attitudes toward suggested situations and relationships that would be typical to the occupation or occupational groups, rather than actual tests of ability to do manipulative operations, solve problems, or recognize mechanical equipment and symbols for equipment. Responses are often made in the expression of "like" or "dislike," or some similar reaction to stated jobs, social situations, or occupations. Among some of the better known tests in this area are the following:

Strong, E. K. *Vocational Interest Blank for Men.* This is a list designed to assist the exploration of success qualities which are applicable to a large number of occupations. It should be especially valuable to students of the upper high school grades and to adults. Stanford University Press.

Lee, Edwin A. and Thorpe, Louis P. *Occupational Interest Inventory.* Two forms of this test are available, one for junior and senior high school level, the other for senior high school to college age. Specific interest areas for which the test is scored are: (a) Personal-Social, (b) Natural, (c) Mechanical, (d) Business, (e) The Arts, (f) The Sciences. California Test Bureau.

Cleeton, Glen U. *Vocational Interest Inventory.* Form A for men. This

test is designed to offer opportunities for self-exploration and responses with reference to occupational interests in a widely scattered area of occupations. The test covers nine sections of occupational similarity and provisions for scoring each section or area separately. McKnight and McKnight.

Kuder, Frederick G. *Preference Record—Form C.* This is a test devised for use in obtaining measures of motivation in study and work rather than a measure of abilities possessed. It measures ten broad areas of educational and vocational interests, and is suitable for high school to adult levels. Science Research Associates.

Achievement Tests

Achievement tests differ from those discussed up to this point in that they are designed to measure proficiency or accomplishments in specific tasks or types of work rather than natural aptitudes or degree of interest. Achievement tests have become common instruments for measuring the attainment in most of the basic subjects in elementary and secondary schools. While mental tests and aptitude tests in general are of value in connection with obtaining estimates of capacities of students to accomplish, achievement tests will show what actually has been accomplished at any given time. Achievement tests may be classified under two general types, standardized, and informal or teacher-made, tests.

1. *Standardized achievement tests.* Tests used to measure relative accomplishments of a class or a school or school system in various subjects such as arithmetic, language, and spelling are usually "standardized." Good [3] defines a standardized test as "a test for which content has been selected and checked empirically, for which norms have been established, for which uniform methods of administering and scoring have been developed, and which may be scored with a relatively high degree of objectivity." In the field of industrial arts, relatively few standardized tests are available and those which have been produced are not always applicable. For this there are probably two reasons: (a) there has been a lack of suffi-

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[3] Good, Carter V. Dictionary of Education, p. 421.

cient uniformity of standard procedures which can be used as bases for such tests, and (b) the necessary research has been lacking in this field through which such measurements are produced.

2. *Informal or teacher-made achievement tests.* The scarcity of formal or standardized tests should not, however, discourage teachers of industrial arts from developing and maintaining a planned testing program as a definite part of their instruction. In fact, it is undoubtedly true that so far as the daily teaching performance is concerned the informal tests made by the teacher contribute more to the learning process than ready-made, imported tests will do. For this there are many reasons. Formal achievement tests generally carry with them a feeling of emphasis upon rating, promotion, and classification. Informal tests can be used without regard to marks and comparison to norms. The teacher can use such scoring as may be done for any purpose he chooses without fear that his students may not measure up and that he will be stigmatized. Fig. 30 shows a class taking such a test. Most important of all is the concept of the validity of a standardized test for any particular class as compared with a teacher-made test for that class. Good [4] defines validity as "the extent to which a test or other measuring device measures what it purports to measure." Only the teacher knows what were the objectives of instruction and the content used for achieving the objectives in each class. A standardized achievement test, made usually in some other locality, is much less likely to be valid for a particular class than would a well-constructed, informal, teacher-made test.

Informal Objective Tests in Industrial Arts

The term "objective test" is now well known by students of all levels of schoolwork. Teachers in preparation recognize

[4] Ibid., p. 442.

them in their various forms and are often ready to analyze them from the standpoint of objectivity and form. Teachers on the job have recognized their superiority over the old type essay questions. When confronted with the job of producing objective tests, however, the teacher will be concerned with basic characteristics and techniques involved. One of these might be, "What is objectivity as applied to a test?" Objectivity, as defined by Good,[5] is: "the quality of dependence on impersonal, factual evidence and established universal truths, rather than on judgment, personal opinion, hearsay, or untenable hypothesis." An attribute of a test so constructed is that identical or very closely similar scores would be assigned by different but equally competent scorers. This definition points to the chief reason for the decrease in popularity of the essay type of test, particularly for industrial arts. The fact that accomplishments in industrial arts work can be measured without at the same time testing competence in written expression leads to both saving of time and maintenance of interest in the work. It should not be assumed from this statement, however, that essay tests have no place in the industrial-arts program. Carefully constructed essay tests can serve as a definite part of the program of instruction and evaluation in industrial arts. Other factors and points pertaining to construction and use of informal tests will be considered in connection with the following discussion of the various forms of achievement tests in common use.

True-False Tests

The true-false test is probably the most widely used of all the variety of objective tests. It is simple in construction and simple to score. The simplicity in the form has made it popular, but it has also furnished a temptation to rely too much upon this single instrument, as well as to assume that the con-

[5] Ibid., p. 278.

struction of the test items is as simple as the appearance of the form. All tests that claim to be objective require a great deal of care and rechecking in connection with every item used. If, in addition, the teacher has in mind, as he should, the test as a learning device, a considerable number of added factors and qualifications become involved. A list of suggestions for construction and uses of informal tests will be found later in this chapter.

When responding to true-false items, various markings may be used, depending upon the wording of the items, as "T" or "F," "yes" or "no," or "+" or "0." The use of "+" or "−" is not recommended because of possible accidental strokes by the pencil or pen which may cause doubtful interpretation.

TRUE-FALSE TEST ITEMS

Directions: Below is a number of statements of which some are true and others are false. If you think the statement is true, put a T in the place provided at the left margin; if false, place an F in the space. Guessing is permitted. You will get credit for all correct answers. The first statement has been marked correctly as an example.

(F) X. End grain is easier to plane than side grain.
( ) 1. A piece of wood 1″ x 12″ x 18″ contains 1½ board feet of lumber.
( ) 2. The difference between a cross-cut saw and a rip-saw is determined by the size of the teeth.
( ) 3. A block plane is the usual tool for smoothing a surface of a board.
( ) 4. Number 1 sandpaper is finer than number 2 sandpaper.
( ) 5. A coping saw should be used for making straight cuts across the grain.
( ) 6. In woodwork a bevel and a chamfer are the same.
( ) 7. Shellac is thinned with alcohol.
( ) 8. Turpentine is the best thinner for lacquer.
( ) 9. Linseed oil is often used as a thinner for house paint.
( ) 10. Kerosene is good solvent for cleaning brushes that have been used in oil paint.

A point to remember when using true-false tests is to be sure to make it clear whether guessing without penalty is permitted. For the average test of this type in industrial arts classes, it is simpler to allow guessing and score accordingly.

Multiple-Choice Tests[6]

In these tests, as is shown in the following sample, several possible responses are listed. One of them is the correct one. The student will be asked to indicate his choice in the manner prescribed. Marking in the margin simplifies scoring. The larger the number of choices, the less will be the chance for guessing. From 3 to 5 choices are commonly used.

MULTIPLE-CHOICE TEST ITEMS

Directions: Read each sentence carefully. Place the letter (A, B, C, or D) which precedes the correct answer in the space provided at the right of each question. The introductory question shows the correct answer.

X. Which of the following lines has arrowheads: (A) dimension, (B) object, (C) extension, (D) center? ___A___

1. Which of the following lines is made the heaviest: (A) center, (B) border, (C) extension, (D) object? ....
2. Which of the following pencils is preferable for sketching: (A) 2H, (B) 4H, (C) 6H, (D) 9H? ....
3. Which of the following woods is preferred for drawing boards: (A) walnut, (B) ash, (C) basswood, (D) plywood? ....
4. Which type of worker uses full size drawings most frequently: (A) architect, (B) machinist, (C) sheet-metal worker, (D) electrician? ....
5. Which of the following lines is made of uniformly spaced short dashes: (A) hidden line, (B) section line, (C) guide line, (D) center line? ....
6. Which of the following instruments is used by draftsmen to measure angles: (A) Braddock triangle, (B) open-divided scale, (C) compass, (D) protractor? ....

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[6] Test items by Paul L. Scherer.

7. If a tracing were to be made of a working drawing, which of the following lines would not be traced: (A) broken lines, (B) guide lines, (C) center lines, (D) leader lines? ....
8. Which of the following materials is used in developing blueprints: (A) sodium chloride, (B) potassium bichromate, (C) benzine, (D) sulphuric acid? ....
9. A cone which has its top removed by passing a plane through it is called: (A) skewed cone, (B) truncated cone, (C) developed cone, (D) right cone. ....
10. An auxiliary view made parallel to an oblique surface will show that surface: (A) elongated, (B) as a line, (C) true shape, (D) foreshortened. ....

Completion Tests

These tests are so constructed that a word or more is omitted in the statement made. The sentence is always true after proper responses are inserted. Care must be taken that only one response can give the accepted meaning. More thought is probably provoked by this type of test than the multiple choice because of the fact that no suggestion is given regarding the correct word or words to be used in the response. Incidentally it furnishes a check on the student's ability in spelling.

COMPLETION TEST ITEMS

Directions: In this test each blank space represented by a straight line shows that a word has been left out. You are expected to furnish the missing word that will complete the statement. Do this by writing the proper word in each space provided. Two lines close together with a space between require a word for each line. The first statement has been completed as an example.

X. Furniture for homes is usually made out of wood.

1. For testing an edge of a small piece of wood for squareness one would use the ....
2. The tool used for cutting out a place for the head of a screw in wood is called ....
3. A ¾″ hole in a board would be bored with a number .... auger bit.

4. The .... saw is used for cutting wood lengthwise.
5. An adjustable tool for cutting large holes in wood is called the .... bit.
6. When gluing wide boards edge to edge they are held together with .... clamps.
7. A .... is a special tool for driving nail heads below the surface of the wood.
8. A tool used for smoothing concave edges on wood is the .... shave.
9. Lacquer is best applied with the .... gun.
10. Powdered casein glue is prepared for use by mixing it with

Matching Tests

The matching test is so constructed as to require the person taking it to connect words or ideas which have indicated relationships. It is usually constructed in two columns of words or expressions with numbers or letters given to each item in order that proper relationship may be indicated. This test can be arranged in a large variety of forms including the use of illustrations and symbols. One limited example follows:

MATCHING TEST ITEMS [7]

Directions: Listed in the two columns below are common layout and measuring tools and their uses in bench metalwork. Place in the blank space at the left the letter which identifies the tool used to perform each operation. *Use each letter only once.* The first item is answered as an example.

X. ...(E)... locating centers of round objects
18. .... locating center for drawing circles
19. .... locating center for drilling
20. .... drawing arcs of circles
21. .... drawing lines at 45° angles
22. .... measuring outside diameters
23. .... measuring diameter of wire

A. caliper rule
B. center punch
C. comb. square
D. dividers
E. hermaphrodite calipers
F. outside calipers
G. prick punch
H. scale
I. sheet-metal gauge
J. surface gauge

[7] Test from Micheels and Karnes, p. 221, by special permission.

TOOL IDENTIFICATION TEST

Below are three groups of tools for identification. Each group consists of pictures of tools which are numbered and a list of names of tools with a square opposite each name of the response. Put the correct numbers in each square for each group. There are more names of tools in the list than there are pictures which means that some squares will not be filled.

See p. 208.

Procedure-Arrangement Tests

This test is a technique for evaluating the degree of understanding of the order of steps to be taken in doing a job or completing a project. As will be seen from the samples shown, the requirement consists of arranging the steps of procedure in a logical order. The steps involved may be listed on cards by the instructor and then scrambled when given to the student but identified with code numbers for rapid checking after they have been arranged by the student. Or they may be listed on paper as shown here.

PROCEDURE-ARRANGEMENT TEST ITEMS

Job: To make a small wooden box.

Directions: The operations listed below are involved in the making of a small wooden box, but they are not stated in proper order. Before starting the project, indicate what the correct steps of procedure should be by arranging the numbers in correct order in the spaces shown under the list of statements.

Steps Involved

(1) Make corner joints.
(2) Cut sides and ends to length.
(3) Cut bottom to fit.
(4) Cut one piece for sides and ends.
(5) Make drawing.
(6) Cut one piece for bottom and top.
(7) Make bill of material.
(8) Glue and nail sides to ends.
(9) Fit hinges.
(10) Apply finish.
(11) Fasten bottom.
(12) Plane all surfaces.
(13) Sandpaper box.
(14) Cut bottom to size.

Rearrange the numbers in correct order in spaces below. *Example:* The first thing to be done is to make a drawing and this is indicated by placing 5 in the first space. (5) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )

Visualization Tests

The ability to visualize is of value in many types of tech-

nical and professional work involving planning and construction. While the test shown here [9] was originally arranged as an aptitude test, it should be equally valuable to evaluate achievement in mechanical drawing and should also indicate ability to visualize construction procedure from drawings.

Identification Tests

The tool identification test [8] shown on p. 206 is another form of matching test. The furnishing of more suggested names than numbers of tools will make correct guessing more difficult. Time limits may be set for completing this and other tests at the discretion of the teacher or the amount of time used may be taken into consideration when scoring.

Object Tests

So-called object tests involve the identification of articles or objects or parts of objects from visual observation. Tools may be arranged on a table or on a wall with numbers attached to each. Students will be given numbered cards for writing in the names. Pieces of materials as copper, aluminum, solder, etc., can be handled in the same way. Such tests furnish a variety in the program and usually create interest. See Fig. 31.

Performance Tests

The types of informal tests discussed so far have application mainly to measuring achievement in the non-manipulative phases of the industrial arts program. The accurate testing of proficiency in tool operations and skill in workmanship is more difficult to do and requires different techniques. Two common approaches may be used, (1) the use of performance test, (2) continuous observation and rating during work.

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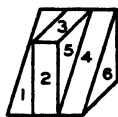
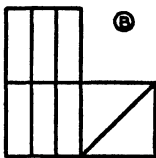
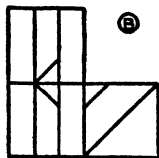
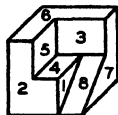
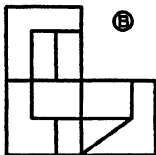
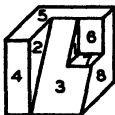
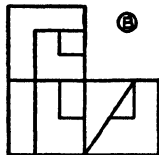
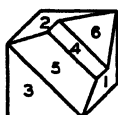
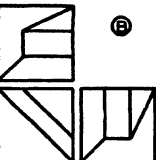
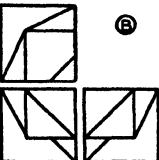
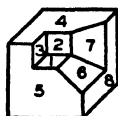
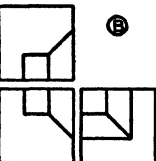
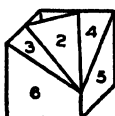
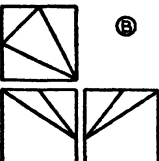
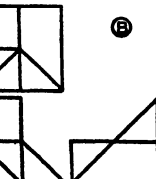
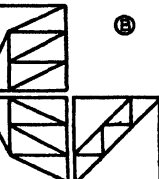
[8] Material for test furnished by Louie S. Taylor.

[9] From *Drawing Aptitude Test* by Weston A. Mitchell, McKnight and McKnight. Used by permission.

Visualization Test

Various procedures may be used in planning a performance test. One would be to give the student access to tools and materials and a working drawing of an article or object to be made. Another might be to furnish a detailed list of steps of procedure, the exact tools to be used for each process, etc. In each case a check sheet would be used by the observer for making up the final score. Rating from continuous observation is normally done by the observing teacher. This method of rating is further discussed later in this chapter.

Suggestions for Constructing Tests

A considerable number and variety of objective shop tests have been published over a period of time. Some of these have been standardized and made available in printed form. Others have appeared in books and magazines as illustrations and examples in connection with discussion of tests and uses of tests.[10] For obvious reasons many situations will arise, however, where suitable tests are not available and where the teacher will wish to construct his own. But, as has been suggested previously in this chapter, the construction of objective tests is not as simple an operation as it may seem at first glance. The following summary and suggestions are offered to the less experienced person who is undertaking to produce objective test items that would serve the largest possible number of the reasons for evaluating student progress discussed at the beginning of this chapter. These are listed at random with no thought of order of importance.

1. *Base tests upon established objectives for the course.* It should be obvious that there should be specific objectives set up for each course. There is danger, however, that these objectives or goals tend to fade as instruction proceeds and that

[10] Examples: *Industrial Arts and Vocational Education* Vol. 37, Feb., 1948; Vol. 38, Feb., 1949; Vol. 39, Feb., 1950; Vol. 40, Feb., 1951; Vol. 42, Feb., 1953; Vol. 44, Feb., 1955.

tests are made to cover other, and sometimes irrelevant, materials.

2. *Cover material which has actually been taught.* Test items may be based upon objectives and still fail to cover specific points or material presented. The suggestion here implies that the teacher keep a definite written record of presentations or discussions. This becomes doubly important when two or more identical classes are taught and the same tests are used for all current classes.

3. *Select significant test items.* Every lesson taught will probably involve a few major items and probably a larger number of minor items. What is major and minor can again be determined at the time of the instruction or by referring to established objectives. These significant items should be kept in mind for review or testing.

4. *Use a sufficiently large number of items.* Within limits a test will probably serve its purpose better if the number of items is not too limited, particularly if giving marks for permanent records is involved. Just what is a minimum number would have to be determined by the purpose for the test. Fifty items might be normal for true-false tests; twenty-five might be considered maximum for matching tests.

5. *Use brief statements.* Extreme care should be taken to make statements brief and free from unnecessary words. Too many qualifying words will often make the meaning ambiguous.

6. *Select suitable vocabulary.* Often a test item is spoiled by the use of a single word which is not understood by the student. Words selected should be within the range of the age or grade or educational achievement of students. Here is a pitfall for inexperienced teachers particularly who have become used to the language of college lecture room and laboratories.

7. *Use no trick questions.* Informal test items covering spe-

cific material taught in class should not be made ambiguous or tricky or call for extraneous mental gymnastics. Such techniques tend to lessen the value and dilute the purpose of the test.

8. *Assure one single response.* Anyone who has worked with this type of test will probably remember embarrassment from getting strange responses which were not on the answer key and having to admit reluctantly that "the question might be construed that way." It is easy for the test maker to have the desired answer so firmly in mind that he fails to recheck the items for other possible interpretations.

9. *Call for evidence of understanding.* To be able to recall facts may sometimes be sufficient. But to understand application and use of knowledge acquired is evidently a better evidence of effectiveness of teaching. If worded with this thought in mind many test items can call for evidence of application as well as factual memorizing in the same response. Some of the comments accompanying the test samples previously presented will emphasize this thought.

10. *Use good mechanical arrangement.* Orderly mechanical arrangement of test material on the page will lead toward ease in responding to the test items. Location of boxes or squares for marking, ease in finding places for the responses, vertical line on left side for responses to true-false tests are typical examples here—unless the test is one of ingenuity in finding the way through a maize of stop and go signs, the procedure in responding should be easy and orderly.

11. *Arrange items in order of difficulty.* It is usually well to arrange the test items on an ascending scale of difficulty. Beginning with the easier questions is likely to give the student a feeling of success at the outset thus avoiding inhibitions often set up from early discouragement when taking the test. This procedure would be recommended for younger students and those less accustomed to this type of test.

12. *Omit obvious and self-solving items.* A good way to learn whether the test items call for responses based on material taught in the class would be to give the test to a group of students of approximately the same general educational achievement who have not been in the class. Items correctly marked by the majority in such a group should probably not appear in the test. While it may not be possible to take advantage of such an evaluation, the approach suggested might well be kept in mind at this point.

13. *Disconnect all items.* One test item should not depend upon another either for clarity of meaning or for correct response. Be sure to start over with the new question without reference to the previous one. A good test of an independent item is whether it can be moved to another location in the test and still be perfectly clear in meaning.

14. *When selection of responses is involved,* care should be taken to keep *all* possible responses as nearly plausible as possible. Test-wise students become clever in selecting the proper responses from plausibility rather than from knowledge.

15. *Use a variety of types of tests.* A variety of types of tests and test items should be used in the complete testing program, as indicated in the samples presented previously. The error of over-using the true-false test because of time saved in its construction should be avoided. This does not mean that test items selected at random from the various types should be put together at random in any one test. If a variety of items is desired in one test each type should be put in a separate group with adequate explanation and instruction each time a shift is made from one to another.

16. *Make condition uniform for giving test.* Whenever the same test is given to different classes or groups be sure to make physical conditions and surroundings uniform for all sections or groups. Ideally this implies the use of the same room, the same seats, the same light conditions and temperature, as well

as identical instructions, and attitude and tone of voice of the one giving the test. Relatively quiet conditions for one class in the early afternoon, and a baseball game outside of uncovered windows for another class the next hour could presumably make the comparison of the test scores unreliable.

17. *Construct test items as you teach.* A practice that should help the teacher to use suitable tests is to make the construction of test items a continuous process coordinated with his daily teaching. A few items put down in connection with each lesson or demonstration would serve in two ways: (1) the items will more accurately cover the material taught, and (2) the job will be more quickly done than it can be at a later date.

18. *Furnish adequate instruction when giving tests.* What was meant to be an objective test can easily lose much of its value by failure to furnish detailed instruction regarding expected reactions and responses. Instructions should appear in written form on the test or on separate sheets so explicit that questions from students would not be necessary. Oral instructions, while sometimes expedient, lend themselves to misinterpretation and should usually not be relied upon as directions for response.

19. *Use sample item and response.* The safest way to explain how the response is to be made to the test is to introduce a sample test item and the proper response. There may be cases, for certain types of tests, where such procedure is impracticable, but for the usual variety employed for most classes it can and should be done.

20. *Identify the tests.* Complete titles, code numbers, subject classification, and other identifying markings should be placed on tests for filing and easy location for future use. An orderly filing system is a valuable adjunct to efficiency in all phases of teaching. Thoughtfulness in cataloging all teaching material, including tests, will save much future time and nervous energy for the teacher.

21. *Recheck and improve tests.* The initial make-up of a test does not very often attain perfection. It will probably need further refinement. The best evaluation of the test will, of course, come through responses by students who take it. An analytical attitude on the part of the teacher will lead to the discovery of needs for improvement. Reactions from fellow teachers who may examine it personally or give it to some of their classes will also be helpful.

The System for Giving Marks

The material presented so far in this chapter has been concerned mainly with evaluative instruments calling for some type of response by students, and with suitable techniques and methods in using such instruments. We come now to another phase of the teacher's varied responsibilities: namely, that of placing definite marks upon the accomplishments of his students. The need for marks and marking is emphasized by at least two factors: (1) the desire on the part of the student to know how well he is succeeding, and (2) the requirement of the administration that marks be furnished at prescribed intervals. To this might be added the teacher's desire to have definite indications of the degree of accomplishment of his students both independently and in relation to the group or groups. This function of teaching is probably the most difficult and the least enjoyable to the conscientious teacher. However, if the teacher has been regular in checking and evaluating the progress of his students, by the means indicated thus far, he will have much collected data that will form a basis for marks and marking.

Marking as a Teaching Device

It was stated previously that one function of tests is to serve as a teaching device. This is equally true for the use of marks and other definite indications of the degree of success experienced by students. While it is true that tests of various types

will often have value without resulting in visible marks, it is also true that the stimulating value of the test is enhanced if the student finds out rather exactly and by a definite mark which he is accustomed to interpret just how successful he was in his responses. Young students as well as adults going to school like to be rated and to know where they stand. Any doubt regarding the adults in this regard may be dispersed by observing teachers taking courses in summer sessions.

Characteristics of an Efficient Marking System

Lack of definite system for giving marks is a common cause for worry and unhappiness in all areas of teaching. In industrial arts the problems involved are probably even more numerous because of the greater variety of activity and student reactions. In the process of setting up a system of marking, a number of basic characteristics would seem to be applicable, among which are the following:

1. *It should consume a minimum of teacher's time.* Little further need be said about the necessity of a grading system that will operate with a minimum amount of time consumption. To organize such a complicated system for checking and scoring work that little time is left for instruction is a mark of poor judgment. By making an effort to save time without sacrificing efficiency in grading work, the instructor can simplify the marking and bookkeeping.

2. *It should be based upon a wide scope of student responses and activities.* It was suggested earlier in this chapter that a variety of tests be used in order that opportunities be given to students who may react differently to the different forms. This applies also to the variety of other factors for rating, including manipulative phases of the program, and all other phases of assigned and volunteer activity pertaining to the classwork.

3. *Marking should be frequent.* The more frequently that

the student's work is observed and marks recorded the more meaningful the final marks of their accomplishments are likely to be. Frequent recording of marks by the teacher will eliminate guesswork and subjective later impressions when time comes for the final mark to be turned in to the school office.

4. *Uniform standards should be applied.* One difficulty in the way of deciding what students should accomplish in industrial arts as compared to students in other schools or geographical areas is the lack of accepted standards indicating what should be taught and what degree of efficiency should be attained. In recent years, exchange of information regarding practices in different schools and school systems and published materials by individuals and professional groups have contributed to some approximation of uniformity of tool processes and areas of study, particularly for the junior high school level. What is still seriously lacking is qualitative standards indicating the degree of proficiency that should be expected in connection with the suggested accomplishments. Regardless of the degree of availability of widely accepted standards, the individual teacher must set up his own definite objectives and standards in such a way that they can be used uniformly as a basis for marks and ratings.

5. *Students should understand the system.* Unless students understand and are in agreement with the system used, it will fall short of its value in the educational process. It takes time to work up a scheme for marking on a cooperative basis, but the time will be well spent. A teacher who sincerely tries this approach for the first time will probably be surprised at the manifold benefits that will be derived outside of the marking system as such.

6. *Students should have access to their marks.* There are two aspects of this concept. One is the practice of acquainting each student with his own marks; the other is the question of posting their standing in open view. The former of these is

probably generally accepted, the second is controversial. Many who have practiced open display of the standing of students in classes have found the practice to be interesting and stimulating to the group. If the question is placed before students they will probably approve the practice. The feeling by some teachers that it will discourage less able students may have some merit. However, is it not true that after a teacher distributes confidential test scores, he will find the students telling one another about their marks? What has been said here would not necessarily mean that final marks for the course would need to be made public to the class.

7. *Students should participate in evaluation.* What can students do in evaluating attainments and what value can be placed on what they do? Some instructors have adopted the practice of allowing students to grade their own work and that of other students. Some instruction sheets are provided with a definite place for student marking—to be checked, of course, by the instructor. The drafting room furnishes an opportunity for using students in checking work. Similar evaluations can be made by students in the other subjects in industrial arts. Whether or not a grade is marked by the student will depend upon the wishes of the instructor.

8. *Marking should be based on objective approach.* The objective approach to evaluative procedures has been stressed repeatedly in this chapter. In industrial arts, true objective measures cannot well be used exclusively. But even when personal judgment and reactions on the part of the teacher must be applied, an attitude of objectivity will make such reactions more meaningful. Qualities of fairness and lack of prejudice can be developed as well as techniques for arriving at unbiased judgments. Figs. 32 and 33 show ways in which students may check and evaluate their own work.

9. *Records must be made permanent.* The marking system in industrial arts should go beyond simply meeting the require-

ments of the administrative office. The teacher needs to accumulate and record additional information valuable to himself and to other teachers under whom the students will take further work. Such records will also serve in connection with future references for the student in advanced schooling or in jobs. Records of accomplishments by students are also valuable in connection with re-evaluation and revision of courses and curricula.

Basic Factors for Marking

The basic factors or points that should be considered in giving marks in industrial arts have been a subject of discussion, and of some disagreement. Historically, earlier practice favored emphasis upon the completed article or project as a basis for final marks in a course. Acceptance of the more clearly developed concepts of industrial arts as general education will automatically bring other factors into play. Basically it would be obvious that if the generally stated goals for industrial arts are valid, they should all be given consideration in developing a marking system. The question would then be: To what extent has the student grown or developed in the attainment of these objectives? With this thought in mind the following factors might well receive consideration:

1. *Quality of work performed.* This will of course involve evaluation of accuracy, neatness, and workmanship. Howmuch skill should be expected will depend upon the age and experience of the student as well as upon relative emphasis upon various objectives by the instructor. Placing emphasis upon correctness in tool techniques and orderly procedure in doing work does not in itself imply lack of appreciation of other goals. This factor can be applied equally well to assignments such as tool clerk duties, shop foremanship, and written responses.

2. *Amount of work accomplished.* There appears to be

good causes for placing stress on development of reasonable speed in schoolwork and for recognizing speed as a factor in the marking system. Opinion is divided as to whether quality should be stressed first in manipulative work, with the idea that quantity or speed will come with added practice. Without attempting a final settlement of this question, it might be said that generally there is too little consciousness of the value of time in our schools. Many students never learn, while in school at least, that they might equally well work at a much higher pace than they do. A definite organization of the class for more efficient use of time would probably bring surprising rewards both in industrial arts shops and in other areas of schoolwork.

3. *Knowledge acquired and applied.* The need of acquiring and applying definite knowledge in addition to manipulative experience has been discussed more extensively in Chapter VII. Checking up on the acquisition of such knowledge, and particularly upon its use and application to the problems at hand, should be a definite part of the marking system. The knowledge here referred to would be that of the related or information type, acquired from class presentations and discussions, experimentation and tool practices, outside study and investigation, field trips, visual aids, etc. There are students who may excel in working with their hands, but who will not even, without much outside pressure, learn the correct names of the tools they use. Again under our concept of industrial arts in the educational program this area would seem to be one of the major ones to be considered when evaluating progress in industrial arts work.

4. *Visualizing and planning.* Ability to plan a job and make mental pictures of it is a prerequisite to independent work. This ability is required in many occupations. The ability here implied would be evident in making required plans and specifications, bills of materials, listing steps of procedure

and similar activities. This ability is probably measured to a considerable degree under factors 1 and 2 above and may not always call for segregated checking. Some procedures for measuring such abilities have been discussed previously in this chapter.

5. *Effort put forth.* There is good reason for recognizing effort and application as a separate item in grading. These are general success qualities which can be encouraged in the school shop and which can be tested there better, perhaps, than in any other subject in the curriculum. Some students who try hard may be less successful in producing fine work than others who apply themselves less constantly. Their effort should be given consideration to the greatest possible extent. Diligence and continuous application are definable personality traits for success both in and out of school.

6. *Habits and attitudes (social response).* The five factors discussed so far would seem to apply mainly to the evaluation of procedures and practices in dealing with material and visible accomplishments. While it can probably be assumed that a rating under these five factors or criteria would at the same time throw light on the degree of possession of desirable personal and citizenship traits such as care and use of tools and equipment, punctuality, participation in group undertakings, and similar characteristics indicating personal growth, this area of student development seems too important to be left to assumptions either in teaching procedures or in points for grading or giving marks. To what degree this factor should be given weight in connection with the overall mark in a course would again depend upon the specific objectives for that course.

The teacher of industrial arts has opportunities for personal association with his students to a greater degree that most other teachers. Frequent observation of student reactions to his work, his fellow students, and the instructor will contrib-

ute to a valuable subjective rating. In addition, personality rating scales [11] of the type shown below will assist in analyzing various aspects of the evaluation. Similar observation rating scales may be arranged for arriving at subjective estimates for any of the factors for marking discussed previously.

PERSONALITY RATING SCALE

Minimum				Average					Maximum
				Self-Reliance					
Does the pupil plan his work carefully and thoughtfully?									
1	2	3	4	5	6	7	8	9	10
Does the pupil conduct the work with only necessary help?									
1	2	3	4	5	6	7	8	9	10
Does the pupil ask for help when the problem is too difficult?									
1	2	3	4	5	6	7	8	9	10
				Work Habits					
Is the pupil in the habit of doing careful and thoughtful work?									
1	2	3	4	5	6	7	8	9	10
Does he loiter or waste time in his work?									
1	2	3	4	5	6	7	8	9	10
				Readiness to Assume Responsibility					
Is the pupil willing to undertake a worth-while task even though it is difficult?									
1	2	3	4	5	6	7	8	9	10
Does the pupil finish all his work?									
1	2	3	4	5	6	7	8	9	10
				Punctuality					
Does the pupil arrive on time at classes?									
1	2	3	4	5	6	7	8	9	10
Does the pupil hand in his work on time?									
1	2	3	4	5	6	7	8	9	10
				Cooperation					
Does the pupil help others when help is needed?									
1	2	3	4	5	6	7	8	9	10
Is the pupil active in group undertakings?									
1	2	3	4	5	6	7	8	9	10

[11] *Forty-fifth Yearbook.* National Society for the Study of Education, Part I, Chapter XVI, "The Measurement of Understanding in Industrial Arts." Contributed by Maris M. Proffitt, E. E. Ericson, Louis V. Newkirk, pp. 317–318. Used by permission.

Minimum	Average	Maximum

Consideration of Others

Does the pupil have the habit of making things pleasant for his classmates?
1 2 3 4 5 6 7 8 9 10

Does the pupil help keep the shop in order?
1 2 3 4 5 6 7 8 9 10

Does the pupil put away tools in the right places?
1 2 3 4 5 6 7 8 9 10

When the whole class is involved in some work does he do his share or skip away?
1 2 3 4 5 6 7 8 9 10

Cleanliness and Neatness

Does the pupil keep himself washed clean?
1 2 3 4 5 6 7 8 9 10

Does the pupil dress neatly and in good taste?
1 2 3 4 5 6 7 8 9 10

Does the pupil do neat work?
1 2 3 4 5 6 7 8 9 10

Optimistic View of Life

Does the pupil have a natural and cordial smile?
1 2 3 4 5 6 7 8 9 10

Does the pupil complain about his lot in life?
1 2 3 4 5 6 7 8 9 10

Is the pupil liked by his classmates?
1 2 3 4 5 6 7 8 9 10

Establishing Intervals for Marking

Periods or intervals for checking and recording student progress in industrial arts may be established in at least two ways:

1. *Grading progressive work accomplishment.* This method places emphasis upon visual accomplishments involving tool operations and techniques, elements of planning, and the quality of the finished product. For this it is effective if the checking is sufficiently frequent. The danger in its use lies in the fact that there is a tendency to postpone marking until the job is completed and then to judge chiefly from the finished proj-

ect. All assignments that involve a number of procedures or operations will lend themselves to the setting up of checking levels or points at which the teacher will evaluate the progress of the student. The more definite and the more frequent these periods are, the more data will the instructor have and, incidentally, the more interest is there likely to be in the work. A good way of keeping record of such evaluation might be a card of the type shown in Fig. 34. Check marks under A, B, C, D would indicate the degree of success evidenced by the student. Similar cards would be used for various subjects. These cards would be accessible to the students at all times.

EVALUATION CARD

	Evaluation			
	A	B	C	D
Article or job				
Planning the job				
Getting out rough stock				
Squaring and surfacing				
Laying out				
Joints				
Jointing and gluing top				
Smoothing parts				
Assembling				
Finishing				
Date Begun .... Final Mark				

FIG. 34. A chart for checking student performance at progressive intervals.

Obviously, the evaluation here indicated is only one phase of the collection of necessary data for the final mark at the end of a course of instruction, but nevertheless a valuable procedure toward that end.

2. *Marking at time intervals.* Under this scheme grading is done by periods, such as daily, weekly, or monthly, regardless

of the type or condition of the work being done. This scheme has the advantage of putting continuous stress upon those points which are not always stressed when emphasizing the quantity and quality of work. There is probably no better scheme than the daily grading system, if the instructor has evolved a method for handling it without sacrificing time that should be used for other purposes.

A chart of the type shown in Fig. 35 will provide for periodic evaluation at a minimum expense of time. The spaces at the top of each vertical column of squares provide for filling

DAILY GRADING CHART

Key to Grade Marks

Quality
Quantity
Attitude
Effort
Knowledge

Sept 14
Sept 16
Sept 21
Sept 23
Sept 29
Oct 6
Oct 8
Oct 13
Oct 15
Ave. Grad Oct

Andrews, Albert
Andrews, John
Bowman, Charles
Cellman, Peter
Davis, George
Evans, Bill
Hall, Frank

FIG. 35. A suitable chart for periodic evaluation of students' work.

in dates when rating is done. Marking in the squares could indicate by code marks the teacher's estimate upon the success of the student. Students selected to participate in the evaluation could use another copy of the same chart. The "key to grade marks" simulates the small squares and indicates location for code symbols for five selected factors for marking. These factors can be selected differently depending upon types of emphasis in the objectives for the course. Purposely, "attitude" has been placed in the center as signifying the crux of desired development in industrial-arts work.

The marking of the chart may be done in one of several ways. The one shown in the illustration makes use of plus and minus signs to signify good work or poor work. Another method would be to use numbers or letters to indicate degree of success as 1, 2, 3, 4, placed in proper location to indicate the factor considered. There should be just as much eagerness on the instructor's part to recognize successes as weaknesses on the part of students.

The chart is so constructed that the record of the entire class is in view at one time. This is of value since it enables the instructor to make comparisons of the accomplishments of various students. The size of the chart will depend upon the number in the class and the extent of the course.

The Open Marking System

Should a chart of the type discussed be placed before the class? It has been customary so long to keep grades and grade marks somewhat of a mystery that a teacher's first reaction to the problem of open grading schemes is nearly always unfavorable.

In my teaching and supervision experience with junior high school students, the question was put before a large number of boys in shopwork whether they wanted to see their grades and have everyone else see them. Without exception they were

enthusiastic about the idea. Daily grading cards covering six weeks' work were adopted, and were so designed that all marking was done by punch marks. These cards were kept on panels, one for each class, made available to the class upon entrance. Each student was responsible for removing his card from the panel, and caring for it during the class period. Cards that were not removed from the hooks at the time of the tardy bell were marked tardy, and those remaining later were marked absent by the use of the punch.

Sometime during the period the instructor would check the work of every pupil and give him a mark, discussing, if need be, the reason for that mark. This removed the mystery from the grades, and the arguments about grades were very few.

The open grading system, in this connection, was instrumental in increasing the interest of the groups to a great degree, as it has also in later experiments, and this interest can be sustained over a long period. There is no secret on the athletic field about how far each boy can jump in the broad jump; why should there be regarding achievement in the schoolroom? If the teacher's record book is honestly kept, let it be "audited" by the students.

The Progress Chart

A progress chart, Fig. 36, is of great value not only for the purpose of checking on the experiences of the students, but also for making permanent the record of such experiences. If a number of similar charts are kept as cumulative record and passed along with the student from class to class, they will show his accomplishments in considerable detail. Different charts can readily be used for different shops, and all these charts put together eventually indicate all major experiences received by the individual student. Such a chart or charts also show to what extent the student has been deprived of valuable experiences in the use of tools or in the performance of jobs

and, without question, discourage a large amount of duplication of the type of work which has lost its learning value but which happens to be nearest at hand.

The progress chart shown here can be used as a device for indicating quality of work as well as for checking performance of operations. The squares may be marked in different colors to show grade marks or numbers or letters can be used.

FIG. 36. Suggested progress chart for tool operations in woodwork.

Student Participation in Evaluation

Many teachers have adopted the practice of allowing their students to evaluate their own work and also that of other

students. Such a practice furnishes valuable educational experience for those who participate. Such a scheme can obviously not be introduced haphazardly without definite cooperative planning between students and teacher. Factors for evaluation must be studied and agreed upon as well as values of each of the factors and other definite considerations that would make the evaluations as nearly uniform as possible. Ratings of this type may well cover aspects of citizenship, work habits, and general deportment; as well as those pertaining to the manipulative phases of the work.

Types of Marking Systems

A great variety of practices in connection with giving marks on student achievement are in common use. Micheels and Karnes [12] list the following seven procedures as being typical:

1. Letter marks based on a four-, five-, or six-letter system.
2. Numerical marks based on a 100-point scale (percentage).
3. Rank order, a number assigned to each student to indicate where he stands—first, second, third, etc.—in the group in which he has been included for the purpose of reporting achievement.
4. Percentile rank, a number assigned to each student which indicates what percentage of his group he has excelled.
5. Descriptive reports written by the teacher.
6. Descriptive reports completed by executing a prepared check list.
7. A report involving only two categories, "Pass" and "Failure" or "Satisfactory" and "Unsatisfactory."

Whatever practice or scheme might be in use in a school or school system, it goes without saying that the teacher will conform so far as records which go to the administrative office is concerned. That will not mean, however, that additional and more detailed records may not be kept by the teacher for his use and for a central student personnel and counseling office.

[12] Micheels, William J., and Karnes, Ray M. *Measuring Educational Achievement,* McGraw-Hill Book Co., Inc., New York, 1950, p. 415.

PROBLEMS AND QUESTIONS

1. In what type of shop classes would effort be given special consideration?
2. In what ways would you determine whether a student is acquiring and applying the necessary "items of knowledge"?
3. To what extent, if any, should the student's personality be taken into consideration when giving marks?
4. Name a number of specific situations in which the "attitude" of students would be tested.
5. Give your reasons for thinking that "pass" or "fail" is or is not an adequate marking system.
6. Other factors being equal, would you give a higher or lower grade to a student who has stayed after school in order to complete a piece of work than you would give a student completing it in the regular class time?
7. What would be the best scheme for grading in a production job in the school shop?
8. Give a list of favorable and unfavorable points with reference to the daily grading system.
9. Do you think that the marking system based upon the standard curve should or should not be compulsory upon teachers?
10. Cite cases in which you or someone else was discriminated against by some teacher because of a poor system of testing and grading.
11. Make out a form for a record card that can go with the student from school to school.
12. To what extent do you think that an open grading system would discourage less able students?
13. Is there, in your opinion, danger that students may be so interested in grades that they fail to benefit otherwise from the instruction?
14. What are the advantages and disadvantages in having students participate in grading their own work?
15. Do you think that students in general are inclined to grade their own work higher or lower than its actual worth?
16. Do you believe that the industrial-arts field has profited in some respects from lack of standard curricula? If so, how?
17. To what extent do you agree or disagree with the five-point grading system suggested in this chapter?

18. Make out a complete mechanical-progress chart for a type of work in seventh, eighth, and ninth grades, following the sample shown in this chapter.

19. Do you consider that uniform standards of attainment for woodwork or electricity for junior high schools should be set up and adhered to?

20. In your opinion is the present tendency toward uniformity of teaching content or away from it?

21. Upon what would you base a set of standards for attainment in industrial arts?

22. What means would a teacher have for checking a true-false test that he has made, before he gives it to his class?

23. Make up a test containing twenty-five multiple-choice statements and twenty-five true-false statements for a shop subject of your choice.

24. Report, from your own experience, cases in which high I.Q. and attainment in shopwork have shown a high degree of correlation, or failed to do so.

25. Do you consider available achievement tests in industrial arts to be as valuable as similar tests for mathematics and English?

26. In what ways do you think industrial arts may be said to furnish superior opportunities for evaluating personal growth?

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Chapter IX

EVALUATING TEACHING EFFICIENCY

Means for Measuring Teaching Efficiency

The conscientious teacher is always eager to learn to what degree his work is efficient. Those who work directly under a supervisor may receive suggestions and personal information from time to time indicating the degree of success of their work. But too often the teacher goes along for the major part of the school year without being aware of any sort of appraisal. In general, there are two available procedures for rating teaching efficiency: (1) self-rating by the teacher, and (2) rating by the administration.

The Teacher Rates Himself

Being rated by others is valuable in so far as the rating is specific, detailed, and comes from an expert. But in the absence of such rating, and even in connection with it, it is of great importance that the instructor should devise a scheme for rating his own effectiveness and work such a scheme conscientiously. To this end it is suggested that the instructor check himself in the light of the following items:

1. *Is enough time being spent on the work for which the salary is received?* There is a tendency for some teachers to get into the habit of feeling that they are "sacrificing" themselves to the "cause," when in reality, a time card kept faithfully for a month would show some interesting facts. It is possible to use much time in begrudging the service instead of using the time to "put over" the job.

Some teachers allow themselves to become engrossed in private enterprises. These, while innocent at first, and in some

cases almost a necessity, may gradually grow until they become treacherous enemies of teaching efficiency.

2. *Is the working time correctly apportioned among the various teaching activities?* Some instructors lose themselves in building equipment, or in designing projects, to the detriment of the students who come *to be taught.* Some of the working time can also be spent in making outside contacts, and in professional development, without having a feeling that it has been stolen from the job.

3. *Is the work being carried out according to a definite, previously prepared plan?* Are regular demonstrations and other methods of teaching continued systematically, or is the statement, "Go to work where you left off yesterday," becoming more common? How often does the instructor have to apologize for lack of preparation in his teaching? Is the course of study being followed, or has the teacher decided, "It was too demanding," with the result that chaos reigns?

4. *Is the teacher skilled in mechanical work?* Largely upon this answer rests the degree of efficiency that can be reached. The best summer occupation for some teachers would be employment in a trade. Standards of workmanship and methods of procedure practiced by the students cannot be expected to surpass those demonstrated by the instructor.

5. *Is the teacher's first interest in industrial arts?* Teachers who are making their work a temporary "stepping stone" have no right to stand in the way of educational progress. Academically minded shop teachers can at the best never get beyond the use of the shop as a laboratory for a certain type of experimentation.

6. *What results are being accomplished?* Is work being finished in an orderly way, or is there an indication that the semester or year will come to a close with storerooms full of incomplete articles of various sorts—a veritable monument of poor management and lack of efficiency?

7. *In what condition is the equipment?* If the equipment was in good shape at the beginning of the course, is it still in that condition through constant care? Or is attention to it becoming irregular, and are methods of handling it gradually becoming lax? Poorly kept tools depreciate the efficiency of teaching, and put the teacher on the defensive.

8. *Are new ideas invited and put into practice?* Will this year's work be exactly like that of last year and the year before, in spite of all the new ideas that have been offered by members of the profession, and changes which have taken place in industry? Are new wood finishes, automobile accessories, drafting-room practices, and the like being investigated and evaluated?

9. *Is the teacher making himself acquainted with new means for evaluating student work?* Is the teacher familiar with the attempts made to standardize phases of shop teaching through objective tests? Such tests may still be imperfect, but the teacher who would be efficient will hasten to make all possible use of them and to assist in perfecting them.

10. *Is the shop library being used?* It is one thing to have a shop library. It is quite another to keep it in use. Is the "reading habit" being developed through these books?

11. *Is related and technical information being applied?* There are teachers who start out bravely with a program for regular presentation of such material. But soon the interest of the teacher is on the wane, and the pupils' interest goes with it. No longer can shop teaching be considered efficient through the bare use of a few manipulative processes.

12. *Are personal contacts being made?* Some teachers teach a lifetime without knowing a single student. They do not come that close. Touching the life of the students is a characteristic of efficiency in teaching. Contacts with parents should be sought also.

13. *In what condition are shop records?* It may save

energy to fail to keep definite records, but it does not spell efficiency in teaching. At the end of the year can parents or prospective employers receive an intelligent statement of all activities of a certain student? If another teacher comes on the job next year, will he find intelligible and adequate information regarding materials used, grades, courses of study, numbers enrolled, and the like? Or must he start from the bottom again?

14. *Is the teacher's health being considered?* It is well to remember that if the instructor does not consider his own physical welfare, no one else will. Supervisors or administrators may not stress this factor until the time comes for the merciless rating in favor of the survival of the fittest, and then the one who has failed to consider his physical fitness loses out in the race.

15. *What is the relationship with fellow workers?* The attitude toward other teachers in the department, and toward those in other departments, tells a forceful story. The instructor who fails to make friends professionally with his associates, or who has a low opinion of them, can hardly reach the maximum of success either in his professional work or in his out-of-school contacts.

16. *What is the relationship with the administration?* By administration is meant supervisor, principal, superintendent, purchasing agent, or any other person in position to pass upon the usefulness and value of the service of the teacher. Is there a feeling of warm friendship mingled with wholesome respect for the principal or supervisor? Or is there simply a cool acceptance of orders, with an attitude of avoiding contacts as far as possible? The latter condition is not always caused by a feeling of insubordination on the part of the teacher. Often, it may be a feeling that the teacher should attend to his own business. Not infrequently, aloofness is caused by sheer timidity. Whatever the cause may be, not

being acquainted with the administration is a disadvantage at the time when the annual rating is being done.

17. *What professional growth is being experienced?* A teacher's life is a many-sided one. The school looks for some things in addition to the hours spent in the shop. Among these is up-to-date information regarding modern policies and practices, aims and objectives. Responses to such expectations come from reading professional journals and books; and from mingling with fellow teachers at institutes and other meetings, including occasional attendance in summer schools.

Rating by Administration

Many kinds of rating forms have been evolved for determining the degree of efficiency shown by teachers. These are of varying complexity and are used with varying degrees of thoroughness, depending upon administrative zeal and available supervisory personnel. The following listing of items has been made up from teacher-rating scales and will indicate a fairly comprehensive sampling of points commonly used in rating industrial-arts teachers.

POINTS USED IN RATING INDUSTRIAL-ARTS TEACHERS

I. *Personal qualities:*

1. Evidence of good health—posture, bearing, cleanliness.
2. Appearance—dress, posture, alertness.
3. Speech—voice quality, diction, vocal variety.
4. Emotional stability—poise, calmness, reserve.
5. Reliability—punctuality, integrity, sincerity.
6. Interest—enthusiasm, originality, initiative.
7. Loyalty—to administration, to fellow teachers.
8. Ethical standards—personal, professional.
9. Tact and self-control.
10. Attitude toward work.

II. *Evidence of professional preparation:*
1. Manipulative skill—tool processes, blackboard sketching, designing.
2. Knowledge of subject matter.
3. Practical experience in craftwork.
4. Use of English.
5. Knowledge of adolescent psychology.
6. Ability to analyze and organize subject matter.
7. Knowledge of related and technical material.

III. *Teaching technique:*
1. Arousing and maintaining interest.
2. Clearness in presentation of teaching material.
3. Class organization.
4. Student participation.
5. Skill in use of teaching aids.
6. Originality.
7. Following courses of study.
8. Coördination and integration of work with other subjects.
9. Evidence of pupil growth.
10. Variety in instructional techniques.
11. Testing for results.
12. Results accomplished.

IV. *Managerial ability:*
1. Discipline.
2. Student participation in management.
3. Routing of work in shop.
4. Variety of projects.
5. Condition of equipment.
6. Use of exhibits.
7. System of tool keeping.
8. Making supplies available.
9. Turning in reports.

These points and others that may be used are usually rated with numbers. The total of all points will indicate an overall score in addition to individual marks for each item and section. The items listed may of course be added to and amplified

in detail. This is done in some school systems, resulting in extended listings of success qualities. The items as presented here will suffice, however, to serve as a checking list for the teacher who wishes to know what supervisors and administrators are most likely to consider marks of successful teaching.

Similar points for evaluation are used in rating cadet teachers under supervision in teacher-training institutions. There appears to be a tendency, however, to simplify teacher-rating scales for this purpose and attempts are often made to group items into larger areas of success factors. Such practice should generally be welcome both by the personnel that will do the rating and the student being rated. Simplified rating forms are also favored by many administrators in public schools.

Teaching Loads and Teaching Efficiency

Much has been said about the relative instructional load that should be assigned to industrial-arts teachers in comparison to teachers of the so-called "regular" subjects. Administrators and teachers of subjects other than industrial arts have been inclined to feel that, in this field of work, class organizations and methods are such that teachers are favored. When this feeling is expressed or allowed to influence teaching assignments it is usually based upon the thought that industrial-arts teachers need not make the preparation for classroom teaching, do not have written papers to evaluate and correct, do not give written examinations, can let students work with a minimum of attention, and on a number of similar lines of reasoning.

Industrial-arts teachers on the other hand are prone to feel that their position in the school is misunderstood, that good teaching in this field requires all that other subjects demand, plus a great many extra details and responsibilities. Usually they confine their reactions to talk among themselves and do very little to clarify their position to those who are not

familiar with their instructional procedure, many of whom would become more sympathetic if they were better informed.

In discussing teaching loads for industrial-arts teachers a number of factors need be considered. Among these are the following:

1. Number of actual teaching hours per day.
2. Length of periods for this type of teaching.
3. Degree of homogeneity of students.
4. Size of classes.
5. Physical facilities for teaching.
6. Types of activity carried on.
7. Teaching methods and philosophy involved.
8. Extracurricular demands upon teachers.

Each one of these will be discussed briefly in following paragraphs.

Number of Classes Taught

In many school systems it appears to be the custom to assign the industrial-arts teachers to a program of continuous teaching for the full school day, while teachers of other subjects are given some free time. The reactions of the former group to this condition is normal and to a great degree logical. Modern industrial-arts teaching requires a large variety of activity in order to satisfy boy interest. While the regular classroom teacher has one topic to prepare for discussion, the industrial-arts teacher must have ready a dozen plans and ideas for the day. In addition there must be materials in readiness, and tools kept in constant condition for work.

There might have been a time when many so-called shop teachers, because of lack of training and vision, simply told the boys to "go to work where you left off yesterday." Today industrial arts involves a study of materials and phenomena concerning industry as well as tool processes. It in-

cludes study about occupations and occupational opportunities, safety practices, intelligent consumption of goods and services, and definite training in coöperative living in social and work situations. To make these experiences a part of the industrial-arts program requires time in preparation on the part of the instructor.

Length of Class Periods

The length of class periods obviously has relationship to the teaching load as counted in number of hours taught. During recent years a definite practice has been to make the industrial-arts periods of the same length as for other subjects in the school. Shorter periods and, consequently, more of them call for more planning for laboratory work, more frequent demonstrations and presentations of information material, and more constant checking on tools and equipment, to say nothing of providing storage space and identification procedures for the work of the added groups. Industrial arts in modern education now receives equal status with other subjects in the curriculum. It cannot do justice to that status, however, unless the teacher is given equal consideration to other teachers in regard to teaching assignments.

Homogeneity of Pupils

The load that the teacher can handle, and at the same time be efficient in his work, depends upon many other factors, however, aside from the number of classes or teaching hours assigned. In industrial arts the drain upon the teacher's energies is often increased by unnecessary mixing of pupils of various ages and grades. The possibilities of placing first- and second-year mathematics students, or first- and second-year history students, in the same class would not enter the minds of administrators and program advisers. But in many cases after care has been exercised to keep everything regular for

other teachers, the left-overs, scrambled in a great variety of ages, classification, deportment records, interest and ability, are sent to "take shop."

There is no intention here to claim that in all industrial classes there must be a single group with reference to age and grade. But the point needs emphasizing that, as the variety increases, the pressure upon the teachers increases, necessitating more time for planning and maintenance of routine.

Size of Classes for Industrial Arts

The size of classes that industrial-arts teachers should handle has been a subject of much discussion. The teacher might well point out that in this type of work individual contact with pupils is a prime requirement. Without reasonable opportunities for personal attention to the problems of each member of the class, the most important outcomes sought would be lost.

The administrator, on the other hand, is faced with problems that are not well understood by the teacher, the greater per-capita cost in industrial arts being an important one. During recent years a general tendency has been to increase numbers in industrial-arts classes. Adoption of new teaching techniques by versatile teachers has helped to keep the larger number of objectives still attainable with considerable increase in the size of classes. However, there is obviously a point beyond which opportunities for any semblance of planned activity cannot be offered.

Physical Facilities for Teaching Industrial Arts

One of the chief factors that determine the maximum number for industrial-arts classes is the size and condition of the shop or laboratory in which the teaching is done. In general when class enrollments are increased, reduction in learning opportunities do not come from the increase in numbers as

much as from the fact that little or no attention is given to a corresponding remodeling of the shop or laboratory for the increased load. To place thirty-five pupils in a room that was built and equipped for twenty-four means not only lack of facilities for the added number but also the disorganization of the program for all. In buildings constructed within recent years, where plans have been made for larger numbers to be accommodated in industrial arts and where the administration has been frank in dealing with the problem of rooms, equipment, and supplies, classes that a few years ago would have frightened most teachers are being cared for under an orderly procedure and with good results.

Types of Activity Carried On

It has been implied in this discussion when making comparisons between industrial arts and other subjects that the type of subject taught will determine to a great degree the number of pupils for the class. This is also true within the industrial-arts offerings themselves. A class in mechanical drawing, for instance, where problem or work books can be used to advantage and where students are confined to a limited working space, might consist of thirty or thirty-five students, although the latter number is probably too high. In a course in radio twenty might draw more upon the teacher's energy and time. Similar differences would exist between other subjects, depending upon working conditions, the nature of the work, and the types and temperaments of the pupils. These points are made to emphasize the thought that one cannot justly stipulate a uniform number for all classes in industrial arts.

PROBLEMS AND QUESTIONS

1. Through what means may a shop teacher avail himself of opportunities to compare his work with the work of other teachers?

2. How much time do you consider that a teacher can devote to private interests and still be efficient in his work?

3. What do you consider the best procedure through which a teacher may improve his craft skill?

4. Through what procedure may a teacher learn how he is rated by his fellow workers?

5. To what degree do you think that the points for rating industrial-arts teachers listed in this chapter are justifiable?

6. Do you believe that it is good practice for administrators to have teachers rate one another?

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Chapter X

CLOSING THE SCHOOL YEAR

Maintaining Shop Organization

The closing days of a course or a year are important days. Often they are sadly neglected. There are many who are enthusiastic in starting a thing, but not so many who will carry that enthusiasm through to the very end. This applies to teachers as well as to students, but students will make the kind of ending that their instructors insist upon. Teachers who have kept a fair degree of organization during the larger part of the course relax at the thought of the work being over, and the last week or ten days is a time of undoing many of the good things that have been accomplished. There is probably more danger of such conditions creeping in at the close of the year with vacation time coming, but change of semesters or classes often presents problems even if in less acute form.

Signs of Break-Down

Many reasons can be recognized for the tendency of the organization to weaken during this period: (1) Regular shop demonstrations and other instruction may appear to be finished, or may have to be set aside, in order that students who have either been too ambitious in the selection of jobs or who have failed to use their time well may be accommodated. (2) Students are rushed for time in completing work, and feel that the year is about over; so tools and materials are not being cared for as during previous days. This is merely an expression of human nature, and not necessarily a sign of worthlessness in students. (3) Tools are borrowed at this

time by other departments, and by groups arranging exhibits, entertainments, and other special features. (4) Senior classes, or individual seniors in classes, feel that they should have a certain amount of freedom, and are often relieved of regular attendance through orders from the central office. (5) The instructor may not be scheduled to return. He may carry a grievance. If he has nursed it long enough, his professional pride and better judgment may be affected, and probably there is lack of feeling of responsibility.

As a consequence of some of these and other factors, many school shops during the closing days are in utter chaos. Conditions may sometimes be so aggravated that students who are already behind in their work find it impossible to carry on. Tools are out of the places where they have been kept throughout the year. The glue is burnt, the clamps are gone, the files are broken or lost, belts are not pulling, and many other facilities are out of adjustment. The well-meaning teacher who assumes that because tools were still there ten days ago they will be there at the close will have his assumptions changed after the rush is over.

Preventing Idleness

The loafer in the shop at this period is the greatest problem. He is the student who in many cases has done the best work and for that reason he is now idle. Each student will work if given a job. And of jobs there should be plenty, if the instructor can find time and resourcefulness enough to recognize and organize them. If the instructor would take an hour to make a list of the items of work which should be attended to before he leaves for the vacation, or before he can meet his next class, and then pick from these items all those in connection with which the students can be helpful, he will find enough work to keep everyone busy until the last minute. Finding special jobs for students seems to be a gift among

teachers. Some can think of a number at any time; others need to make definite preliminary plans for such assignments. In all cases the special jobs should be rotated so that students may get as wide experience as possible.

Reconditioning Tools

Hand tools of all kinds are likely to rust during the vacation months unless given special attention. Oily waste for general cleaning, and fine emery cloth soaked in oil for rust or discolored spots, will serve well. This part of the job applies to all shops, and to do a thorough job will engage a number of students for a considerable length of time. Here is a suggestion also for the tool clerks for this period, if there is spare time in their schedule.

In all shops, but particularly in the woodworking shops, there is need for putting tools in condition for the coming term. Grinding edged tools is a large task in itself, and if the teacher leaves it for himself or his successor to do much time will have to be spent in routine work which makes a good training job for students if given at this time. If such work is assigned, however, it must be followed up very closely, for poor grinding of edged tools is worse than no grinding. It takes as long to grind a tool over again as to do the job right in the first place. No apology needs to be made for asking students to assist in reconditioning tools that they have worked with during the year.

Care of Power Machinery

Under this heading may be pointed out many jobs that students can do under the teacher's direction, jobs that are of as much value as any other work done during the year. Teachers are inclined to feel that students of high-school age are not reliable in such operations as lacing of belts, grinding knives for woodworking machines, filing circular and band

saws, and the like, when at the same time those students are grinding valves of automobiles, timing the spark, and even completely overhauling automobiles, either at home or in school.

If the teaching has been up to expectations during the year the frame of mind of students at this time should be such that they will gladly tackle any job assigned and welcome the responsibility that goes with it.

Leather belts that have been in use throughout the year are in need of thorough cleaning. Warm water and naptha soap applied with a stiff brush will do this job. If such belts are not to be used they may be stored in a separate place. All belts not cleaned should be removed from the pulleys. If outside workmen are to use the shops during the vacation time, such an emergency is best provided for in woodworking by having an extra set of knives and saws so that one set may be kept under lock and key for use for opening school in the fall.

Conditioning Stockrooms

No place in the shops is more likely to need special attention than the stockrooms and supply cabinets. This is true whether metalwork, auto mechanics, electrical work, woodwork, printing, or any other type of shopwork is engaged in. Even with the best type of system and teaching it is difficult to keep supplies in perfect order, and the end of the year is no exception.

Two phases of activity will appear in this connection: (1) straightening of the stock, and putting it into an orderly arrangement, and (2) taking a complete inventory of the material on hand. In handling some types of material it may be best to do these two jobs simultaneously; in some cases, as with lumber, the inventory can be taken after the material

INVENTORY AND REQUISITION FORM SHOP SUPPLIES					
On Hand	Amount Needed	Unit	Article	Unit Price	Total
		Lbs	Nails: Finish, 12d		
		1/8 lb	Tacks: Carpet, 1-oz		
		1/8 lb	4-oz		
		1/8 lb	8-oz		
		1/8 lb	Bill-Posters'		
		Box 100	Upholsterers'		
		Gal	Oil: Compressor		
		Gal	Dynamo and Motor		
		Gal	Red Engine		
		Gal	Zerolene No. 3		
		Lb	Cup-Grease		
		1/2 pt	Household Lubricant		
		Gal	Gasoline		
		Gal	Kerosene		
		Only	Oiler: Malleable-Iron No. 3		
		Only	Coppered-Steel No. 16		
		Only	Extra Spout for No.3 Oiler		
		Only	Extra Spout for No.16 Oiler		
		Only	Padlocks, Yale No. 815		
		Lbs	Rags, clean, white		
		Sheets	Sandpaper: Tri-mite, No. 100		
		Sheets	No. 220		
		Sheets	No. 320		
		Lbs	Steel Wool: No.2		
		Lbs	No.1		

FIG. 37. Inventory and requisition form for supplies. (Original Mimeographed on Sheets 8½" x 11".)

is arranged according to kinds and sizes. A typical blank for this purpose is shown in connection with the discussion under inventories. See Fig. 37.

Order in the Finishing Room

The finishing room, whether it be in connection with woodworking or metal finishing, is one which needs special attention. Here three months of time, particularly of summer-vacation time, can play more havoc than almost anywhere else. And if there are teachers who because of their own orderliness are inclined to feel that these suggestions are unnecessary, it is recommended that they visit three or four ordinary wood-finishing rooms in schools in order to get first-hand information. Even a limited visit of that kind will convince anyone that more needs to be said upon this subject.

That each brush that is worth saving is worth cleaning first should be a matter of common agreement that will result in action. Money is wasted on new brushes when the old ones would serve just as well if they were washed in kerosene and wrapped in paper immediately after they were used. Materials are available for softening brushes in which paint has dried. The average student and, apparently, some teachers, do not know that to lay a cover over a can of paint or varnish is not to seal it up. Quantities of this kind of material could be saved in the school if students were taught to step on the cover and then turn the can upside down for storage.

A general cleaning of the room, scraping of paint and putty from tables, and throwing out of old cans, sample pieces, and other refuse, will go far toward starting right with the next group.

Equipment Inventories

The students can be of help in taking the required inventory of the equipment. This inventory should not be of the

INVENTORY AND REQUISITION FORM PRINT SHOP EQUIPMENT					
On Hand	Amount Needed	Unit	Article	Unit Price	Total
		Only	Type-Cabinet: California Case		
		Only	Wisconsin Case		
		Only	Leader-Boxes, No.3185		
		Only	Letter-Boards, No.2495		
		Only	Rack, Lead and Slug, No.3225		
		Only	Stands: Case, No.2545		
		Only	Type-Case, 12 each		
		Only	Rack, Chase: Steel		
		Only	Wood		
			Makeup and Storage Material		
			Tools, Equipment		
		Only	Bellows, Small Valve		
		Only	Brushes, Benzine		
		Only	Composing-Sticks: Adjustable, 6"		
		Only	8"		
		Only	10"		
		Only	12"		
		Only	20"		
		Only	Standard Job, 6 x 2 1/4		
		Only	12 x 2 1/4		
		Only	Font Metal Furniture, 25 lbs		
		Only	"S" Font Steel Furniture		
		Only	Font Wood Furniture		
		Only	Galleys: Single-Column		
		Only	Double-Column		

FIG. 38. Inventory and requisition forms for equipment. (Original Mimeographed on Sheets 8½" x 11".)

kind so often taken in the school shop, one which actually results in no definite value except to keep the boys busy, but should be of the type acceptable in a business concern. If this work is properly supervised it will furnish as fine training as any that the boys have had during the course. When the teacher has in his hands the results of this inventory, he should be able to tell: (1) the number of tools of each kind on hand, (2) the working condition of each tool, (3) parts needed for repairs, and (4) where they are located. As the inventories are taken the tools should be moved into certain locations so that no duplication will take place.

In order to have this work produce definite results it is necessary: (1) to have some kind of blank that calls for specific data, and (2) to follow up the students closely to see that no guessing is done in filling in these forms. An illustration of a card from a card-file accumulative inventory is shown in Fig. 19. A sheet of the kind often furnished by the school board for this purpose is shown in Fig. 38. The exact arrangement of the blank is not of great importance, provided the necessary items are included. The inventories of the previous year should be consulted as a matter of check. If this is not done, some tools may be overlooked.

Advantages of an Orderly Finish

Many advantages of doing the work of the shop in an orderly way are apparent, among which are the following:

1. Students receive additional knowledge and experience and acquire valuable habits.
2. Students who leave the shop and do not return carry with them a respect for the work and for the teacher.
3. Students who return will be in better frame of mind to start in the right way, and will reap the profit of their work done at the close of the year.
4. Visitors, of whom there are many during the closing

days, and prospective students form a good opinion of the conditions maintained.

5. The teacher is largely relieved of the work which he otherwise would be obliged to do before the beginning of school.

6. It will be easier to start the work properly when new classes come in.

Reports

Some teachers chafe under the idea of having to make semester or annual reports. The more far-seeing ones among shop teachers will welcome the opportunity to do so. Even though no report is asked for, the instructor should take the opportunity to put in writing some of the important phases of the program for the semester or school year. Just where such a written report should be sent the instructor can determine from circumstances. In smaller systems where there is no supervisor it may be sent to the principal or directly to the superintendent. Through the annual or semiannual report the teacher has the opportunity of placing before the administrator a number of facts, including at least the following items:

1. The number of students served.
2. The types of work covered or taught.
3. The number of hours taught.
4. New courses installed during the period.
5. Special projects engaged in, for school, community, or other agencies.

Such report may well be accompanied by a few photographs of work done, or classes in action, with the possibility that they may be shown to others that are interested, including the board of education. The report should be brief and to the point, with the material tabulated as far as possible.

Supervisors or superintendents do not wish to read verbose statements in this regard, even though the best of English and diction be used. The more that can be said in a small amount of space, the more attention will the material probably receive. There is publicity value in reporting upon the work.

Teacher's Recommendations

Connected with the type of report that has been discussed there can well be recommendations for changes and expansions. Conditions causing serious drawbacks to the work can be mentioned, as well as suggested remedies.

Whatever recommendations are made should be based upon sane reasoning, however, and made with the idea that action will be taken. Before asking that things be done the instructor must figure the result from all angles. The reasons upon which requests are based should be shown in full. Requests can be courteous and at the same time firm and decided. Without a conviction that the instructor knows what he is talking about the superintendent will not seriously consider any recommendations. Some teachers are in the habit of asking for much more than is expected. This is a bad practice, for it displays insincerity on the teacher's part, and destroys confidence on the part of the administration.

Permanent Records

In previous chapters the records of students and their work have been discussed somewhat at length. It remains only to say here that a teacher with professional pride will be scrupulous in the task of completing all possible records for students. These records may become of increasing value in the future, and should be considered a sacred charge.

Recommending Equipment and Supplies

Requests for new equipment, and complete requisitions for

needed supplies, should be furnished before vacation time commences. This is a good practice, even though the instructor may intend to be on the ground during the intermission, for it frequently happens that the major items of expansion and expense are decided upon early and the money for such expenses budgeted. What was said regarding recommendations in general holds good here, namely, that it is important to be positive in one's statements, and reasonable in requests for expenditures. Clear justification should be offered for each item requested.

How to arrive at figures for supplies was discussed briefly in Chapter I. With the experience of the year or semester as a background, the instructor will now be in better position to make an accurate estimate of the needs. If he has been thoughtful in keeping exact records of what has been used, little time or effort should be consumed in preparing requisitions of supplies for such courses as will be repeated in the future.

Thinking ahead is the secret of being able to provide the shop with the needs for future work. When the board of education requests, as it often will, complete requisitions in May for material needed in September, there is a temptation to use a wholesale method of treating the problem rather than to take time to analyze the situation. It might be suggested here also that an efficient instructor has his requisitions ready at the time requested. Such promptness is a matter of habit. By efficient planning it is just as possible to be a day ahead of one's schedule as a day behind.

PROBLEMS AND QUESTIONS

1. What are some advantages of having the students take inventory?
2. How should a shop teacher manage the problem of lending tools to other departments?
3. Why is it a good practice for the teacher to keep a per-

manent record of the work of all pupils who take work under him?

4. Write a report to a superintendent covering the work of a junior-high-school class in woodworking in high school, or in junior high school. Assume such a range of activity as you would expect to have in operation.

5. Draft a set of rules for the wood-finishing room that will largely do away with the problem of special attention during the closing days.

6. Organize, on paper, a scheme for straightening the shop, in which you think all students would be interested.

7. Upon what conditions, if at all, should students be allowed to borrow tools for home use?

8. What can the teacher do with unfinished projects or articles at the end of school?

9. Make out a requisition for material for a class of twenty boys for one semester in either electricity or elementary woodwork, and show your methods of arriving at the amounts.

10. Make a list of jobs for students during closing days, aside from those named in this chapter.

11. Make a written presentation to a superintendent proposing the introduction of courses in radio for the ensuing school year and show assumed conditions warranting the proposal.

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LOS ANGELES CITY SCHOOLS

FIG. 39. A study in transportation gives opportunities for self-expression through handwork.

SANTA BARBARA COLLEGE, UNIVERSITY OF CALIFORNIA

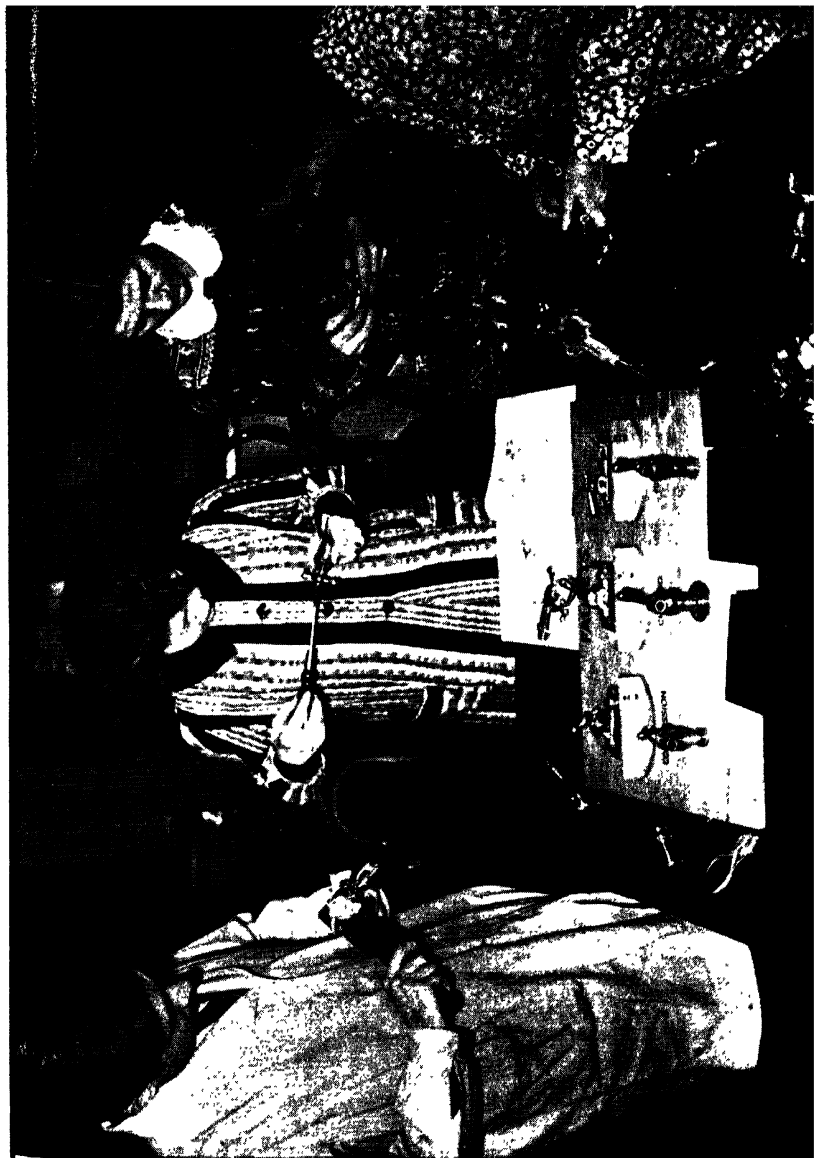
FIG. 40. Making models of furniture encourages creative expression as well as evaluation of construction methods and quality in design.

CHICAGO PUBLIC SCHOOLS

FIG. 41. Opportunities for experience in household maintenance are equally valuable to girls and boys.

SAN DIEGO CITY SCHOOLS

FIG. 42. Photography is a pleasant and popular hobby for both young and old.

Chapter XI

OBJECTIVES, OUTCOMES, AND GOALS

Clarifying Objectives

In various preceding statements in this book stress has been placed upon the need for objectives and goals as bases for instructional activities and programs in industrial arts. It has been emphasized also that these objectives should evolve from the concept that industrial arts is basically an integral part of general education. However, while this general concept is widely accepted in principle, there is much need for further clarification and interpretation of its meaning and practical applications before the program of industrial arts can expect to serve in the position which it offers to assume in the total education program. A pertinent statement at this point appears in a bulletin by the Industrial Arts Policies and Planning Committee of the American Vocational Association as indicated by the following quotation.[1]

"The privilege of being a part of general education carries with it certain great and even grave responsibilities. Furthermore, the general education criterion suggests a unique approach to the determination of objectives. Among the many responsibilities which are implied is the necessity of deriving instructional content from the *many* ramifications of industry. The subject of study should be not only industry in terms of *materials, tools* and *processes*, but also industry as *science* and *invention;* industry as the *means of producing goods and services;* and industry as a *unique pattern of human relationships.*"

The foregoing statements emphasize again the fact that if industrial arts is to justify its position in general education there must be an expansion in realization of objectives far be-

[1] *A Guide to Improving Instruction in Industrial Arts,* 1956, p. 11, American Vocational Association, 1010 Vermont Ave., N.W., Washington 5, D.C.

yond that which can take place when putting the sole emphasis upon the manipulative aspects of the teaching content.

Industrial Arts and Vocational Education

Much of the confusion in connection with aims and goals in industrial arts, as well as in content and teaching methods, comes from a lack of distinction between the fundamental purposes and position of *industrial arts* as contrasted with *vocational education.* While these two activities have common characteristics to the point that they may appear similar when viewed superficially, they are two distinct and independent areas in education. They must be so recognized if either is to be expected to render its maximum service in the educational program. The following listing should be helpful in pointing out distinguishing characteristics of each of these two fields.

CHARACTERISTICS OF INDUSTRIAL ARTS	CHARACTERISTICS OF VOCATIONAL EDUCATION
1. A definite phase of general education based on values attained principally through manipulative activity and study of industrial materials and of industrial life.	1. A specialized program for the purpose of preparing students for remunerative employment.
2. Emphasis placed upon exploration and participation rather than upon skill and efficiency.	2. Development of trade skills and occupational competence is emphasized.
3. Open and valuable for all students whether talented or not.	3. Students selected with reference to aptitude for the work.
4. Pupils of all ages eligible.	4. Available to students of high-school age and older.

5. Aims best served through a variety of experience with tools and materials representing many industries and crafts.	5. Concentration on one trade or occupation.
6. Equipment need not match industrial conditions.	6. Working conditions and equipment should basically be parallel to industry.
7. Classes held for single class periods except in special cases.	7. Work carried on three or more hours per day in trade practice and related subjects.
8. Not reimbursed through special federal funds.	8. Reimbursable through state and federal funds.
9. Teachers primarily prepared in teacher-education institution.	9. Teachers selected from trades and given professional courses or programs.
10. Course content, length of time, etc., determined by school conditions.	10. Course content and duration of courses arranged through advisory committees.
11. Projects are chosen with reference to student interest and educational needs.	11. Work assignments based upon practices in the trade.
12. Success measured in terms of pupil growth rather than skilled work.	12. Standards of workmanship judged in the light of demands of the trade.

Listing Desired Goals

Much criticism has been directed against the tendency to declare aims and purposes on paper and then to ignore them in the teaching process. Some of this criticism is justified. However, there is probably less likelihood that a teacher who has once stated a set of aims will forget to work for their con-

summation than that the person who has never stated conscious aims will work toward definite goals. Aims, if seriously formulated, in themselves imply procedures for their attainment.

With the thought in mind that it is more fruitful to think of final outcomes than initial declarations, the following statements are presented as "desired goals" for industrial arts. Somewhat reworded, they could all be made into statements of aims or objectives.

1. Self-discovery by the pupil of his own abilities and aptitudes, leading toward maturing life interests.
2. Satisfying experience in self-expression through creative effort leading to material accomplishments.
3. Understanding of industry and methods of production, and of the influence of industrial products and services upon the pattern of modern social and economic life.
4. Appreciation of good design and good workmanship in their application to construction and to manufactured products.
5. Judgment and resourcefulness in selection, purchase, use, and care of industrial products and services both in the home and in occupational life.
6. Ability to use tools and materials leading to household maintenance, leisuretime pursuits, and, in some degree, to basic occupational skills.
7. Ability to read and make sketches and drawings used for illustrative and construction purposes, including the ability to read graphic and technical illustrations in books and magazines.
8. Development of maturing work habits, feeling of responsibility, and ability to plan and execute work alone and in coöperation with others.
9. Basic experience in the use of tools, machines, and materials of value in carrying on future educational and professional work on scientific and technological levels.

10. Development of safety habits and fundamental safety consciousness not only in the school but in the home and in future occupational life.

No attempt has been made here to refer to all values that should come from participation in the industrial arts. Only those goals which are peculiar to industrial arts or which are thought to be best served by this field of schoolwork have been listed. The following paragraphs will present a brief discussion of each of these goals.

1. *Self-discovery by the pupil of his own abilities and aptitudes, leading toward maturing life interests.* Self-discovery has intentionally been placed first among these goals. As interpreted here this thought goes far beyond the mere opportunity for exploring a few mechanical occupations and perhaps selecting one of them for a life career. Nowhere in the school is there a better opportunity for perplexed youth to discover himself than in the industrial-arts program under sympathetic leadership and guidance. In the informal setting of this program, students are relieved of much of the strain and stress of the formal classroom or counselor's office, and can more objectively discover their own likes and dislikes, their success qualities and their limitations, both in regard to occupational choices and personality traits.

2. *Satisfying experience in self-expression through creative effort leading to material accomplishments.* All normal children have a strong desire to construct things and to express themselves through creative work. The industrial-arts shop or laboratory is rich in promise for such opportunities. It can be equally rich in results if the teacher will guide pupil enthusiasm in right channels and see to it that formality and lack of vision do not prohibit the attainment of this goal. See Fig. 39.

3. *Understanding of industry and methods of production, and of the influence of industrial products and services upon the pattern of modern social and economic life.* With the increased mechanization of the mode of living, it becomes in-

creasingly desirable, if not necessary, that every person shall have a broadened appreciation of industry and its effect upon modern life. The typical industrial-arts shop probably falls short of giving maximum service to this goal. But industrial arts has within its area of instruction the greatest opportunities afforded by the school curriculum in this important field of education and the future teachers will be alert to take advantage of these opportunities. Mass-production jobs in the school, visits to industry, suitable motion pictures, and class organization patterned after factory management are but a few of the possibilities leading to realization of this goal.

4. *Appreciation of good design and of good workmanship in their application to construction and to manufactured products.* It has been argued that it is not possible in the limited time available in industrial-arts classes to make any significant contribution under this goal. This might be largely true if immediate abilities are to be the measure used. But the significance is that basic principles and attitudes can be established with young students in a limited amount of time, leading toward continued investigation and study in this increasingly important area.

5. *Judgment and resourcefulness in selection, purchase, use, and care of industrial products, and services both in the home and in occupational life.* Machines, mechanical devices, and appliances are increasing at an appalling rate. Every person's well-being is dependent daily upon their use. Some first-hand experience with materials, tools, and machines will enable a person better to solve the problems that pertain to their purchase and use. The teacher must keep in mind, however, that to teach routine tool processes only will not in itself guarantee that pupils will attain this goal. Specific planning must be done to give students the necessary stimulus for broad investigation and to give them experiences upon which this type of resourcefulness is built. See Fig. 40.

6. *Ability to use tools and materials leading toward household maintenance, leisuretime pursuits, and to basic occupational skills.* This goal needs little explanation. It is commonly expressed and commonly accepted. The degree of skill to be expected is, of course, dependent upon many factors—age of students and time allowance being two important ones. Skill in itself cannot be considered undesirable provided that it is not overstressed. See Figs. 41 and 42.

7. *Ability to read and make sketches and drawings used for illustrative and construction purposes.* This is also a recognized goal which needs no justification. It needs interpretation, however, for the reason that too many teachers confine the opportunities in this area to a few exercises in lettering and meaningless practice in the use of tools and instruments. If this goal is to be reached as here interpreted the work must be based upon future use on the part of every person rather than by a few who will go into professional work in this field.

8. *Developing of maturing work habits, feeling of responsibility, and ability to plan and execute work independently and in coöperation with others.* The common cry against young people who go to work is that they have no established work habits acceptable in business or industry. The industrial-arts shop or laboratory is probably the best place in the school for the development of such habit, provided, of course, that the teacher is aware of the fact that they are not usually an automatic product of his teaching. With conscious planning under which the student is in a similar position to a workman on a job, the qualities mentioned under this goal can be attained to a marked degree even by boys of early adolescence.

9. *Basic experience in the use of tools, machines, and materials of value in carrying on future educational and professional work.* Advocates of industrial arts have long maintained that this program is of value to all children. It has been made compulsory in most junior high schools. But specific values

in the secondary schools for shopwork as a desirable background for students who expect to go into advanced work in scientific research, technological work, medicine, etc., have not been sufficiently recognized. The following quotation indicates a clear recognition of the need of industrial arts for this type of student.

> . . . we shall say something about the importance of shop training in general education. For those who intend to go into scientific or technological work, it has special relevance. The manipulation of objects, the use of tools, and the construction of simple apparatus all are required for entry into the world of experimentation. Even the pure mathematician is greatly aided by shop experience; the forms, contours, and inter-relations of three-dimensional objects provide a stimulus and satisfaction not to be achieved altogether within the limits of plane diagrams. The lack of shop training is at present a most serious deterrent to entry into all types of technological work and to college and post-graduate training in science, medicine, and engineering. What students should learn in secondary school specifically is the use of simple hand tools and the execution of simple basic operations such as soldering and elementary glass blowing and joining. If the student can be taught to operate a drill press, a wood lathe, and a machine lathe, so much the better.[2]

The value of basic mechanical resourcefulness has been increasingly apparent during the rapid expansion of technological work and scientific progress of recent years. The ability to do has become equal in importance with the ability to think; and often discovery, research, and planning can be carried out only piece by piece to the degree that mechanical and manipulative work accompany theoretical developments. When this importance is more fully recognized, institutions of higher learning will be more ready to recognize mechanical work as a legitimate part of entrance requirements.

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[2] Report of Harvard Committee, *General Education in a Free Society*, Cambridge, Massachusetts. Harvard University Press, 1945.

10. *Development of safety habits.* This should be a legitimate goal for two reasons: (1) Strenuous efforts must be made to diminish the appalling accident rate; and (2) the very atmosphere of the school shop lends itself to the stressing of safety habits. Not only can safety instruction be stressed in regard to use of tools, machines, and materials in the school, but it would seem most appropriate to carry over the instruction to use of cars, home appliances, electrical equipment, and many other hazards in and around the home.

Emphasis on Goals According to Age Levels

Not all of the goals listed and discussed in this chapter are of equal importance for all ages of pupils. In elementary schools, including the first six grades, little or no formal work is now carried on in separate industrial-arts classes. Here the manipulative work is done in close coördination and integration with the total study program of the school. Self-expression and self-discovery are important outcomes. Sheer joy experienced in doing things at this age is in itself valuable but can be made more so if the experience is given relationship to a "unit of work" or a body of knowledge of social and educational value. High interest developed in manipulative work also tends to carry over into other fields, since investigation in geography, history, arithmetic, and other studies is often stimulated through the desire to construct things in material form.

In the Junior High School

All of the ten goals are most uniformly attainable for the junior-high-school level. Here industrial arts is taught in its most diversified form and without the restrictions of occupational-training bias or highly technical emphasis. Attention is again called, however, to the fact that to state a desirable goal is one thing and to attain it another. These goals are pupils' goals and whether they will be reached will depend upon the degree of effort contributed by the teacher.

Emphasis for the Senior High School

In the senior high school most of the goals discussed take on an extended meaning. At this level the acquisition of skill may receive more attention. Developments of maturing work habits, and independent and coöperative effort, may be expected to reach more advanced stages at this age. Since there is more likelihood that the student has made at least a tentative choice of an area of occupational work he can now choose subjects in industrial arts that will strengthen his background for further education or occupational training.

Imperative Needs of Youth

The approach to the consideration of goals from the standpoint of *educational needs* to be satisfied furnishes a basis for analytical procedures in the search for desirable instructional content as well as suitable methods leading to the attainment of desired goals. In considering the area of "needs" as basic to objectives and goals, it seems apparent that such needs will fall under at least two classifications: (1) general needs that are common to all children and youth and, (2) individual and probably changing needs which vary with the community, the school, the individual, and the area of study under consideration. A widely accepted presentation of general needs of youth has been presented by the Educational Policies Commission [1] under the caption of "The Ten Imperative Educational Needs of Youth." A listing of these needs will be made in following paragraphs, with comments upon relationships of our common objectives for industrial arts and the degree to which these needs might be served by the industrial arts program.

1. *All youth need to develop salable skills and those understandings and attitudes that make the worker an intelligent and*

[1] *Education for All American Youth: A Further Look,* The Educational Policies Commission, Washington, D.C., 1952, p. 216.

productive participant in economic life. . . . The contribution of industrial arts to this need will presumably not be so much in furnishing trade skills in a specific occupation as in offering opportunities for understanding basic requirements in any type of employment. The development of general employability traits, work habits, attitudes of coöperation, resourcefulness, and feeling of responsibility have long been stressed in industrial arts. It is generally known that the great majority of those who lose their jobs in industry and business do so not because of lack of ability to do the required work, but because of lack of the necessary personal attributes that would enable them to fit into the organization or the personnel setting in which they find themselves. This again places further emphasis upon the need for re-evaluation of the pressure on attainment of skills without at the same time offering the manipulative work in an organization which will be conducive to the development and practice of employability traits. Much can yet be done in the majority of industrial arts shops to develop an atmosphere and a work program in which students will become conscious of the world of work in which they soon must find themselves and in which there will be opportunity for coöperative participation that will give actual practice and application of general employability traits. More advanced tool and operational skills can sometimes be offered in advanced courses, but in most occupations these can be learned on the job if basic work habits have been acquired previously by the employee.

2. *All youth need to develop and maintain good health and physical fitness.* While industrial arts should not attempt to take the major responsibility for serving this need, there will be many opportunities for unique contributions to it. The phenomenal development of new materials and new processes in industry is carrying with it a constant need for study and understanding which in many cases can best be accomplished

in the area of industrial arts. Facts about chemical products, including paints, lacquers, bleaches, solvents, fuels, gas appliances, exhausts and fumes, and many others, can and are normally included as direct or incidental learnings in the industrial arts setting, where the broader concept of the program is appreciated by the teacher. If safety education is also implied under this need, another wide area of applications is at hand in the industrial-arts program, both with reference to those safety practices that must be employed in the school shop, and in the broader application of safety in the home, on the road, and in employment.

3. *All youth need to understand the rights and duties of the citizen of a democratic society, and to be diligent and competent in the performance of their obligations as members of the community and citizens of the state and nation.* The modern school endeavors more and more to offer opportunities for youth to participate in democratic procedures and group cooperation. Service to this need can be and is rendered in many ways in industrial arts. But as with most other stated objectives and goals, such contribution is not an automatic outcome of haphazard class organization and procedures. Mass production jobs, group projects, student organization for class management, and evaluation by the students of their own and other students' work would be typical experiences leading to growth and maturity in citizenship. Study of traffic codes, building codes, and zoning ordinances would be typical of others.

4. *All youth need to understand the significance of the family for the individual and society and the conditions conducive to successful family life.* Aspects of this need are covered or implied in several of the goals listed previously in this chapter. It would seem logical that goal number 4, which refers to "appreciation of good design and good workmanship," is applicable here. Abilities leading to household main-

tenance should develop sympathetic understanding of material aspects of home life. Judgment and resourcefulness in selection, purchase, and care of industrial products should help to lead to "conditions conducive to successful family life." If the teacher will analyze the implications involved in this need he will no doubt be able to discover many possible learning situations that will serve it, particularly on the secondary school level in classes for both boys and girls.

5. *All youth need to know how to purchase and use goods and services intelligently, understanding both the values received by the consumer and the economic consequences of their acts.* This statement appears to define many opportunities for experiences and understandings in the industrial arts program. If the teacher has become impressed with the broader objectives of industrial arts, he will find many occasions to organize the classwork for greater contribution to this need. Attention to relative value and cost of various materials used in individual and group projects under construction, durability as indicated by structural features; types, costs, and suitability of different finishes; and attention to appropriateness of design are but a few of these. The proper care and maintenance of the home, its furnishings, and mechanical equipment will involve much additional possible content for study and investigation. Implications for responses to this need might well indicate enrichment in practically all subjects and areas of offerings in industrial arts.

6. *All youth need to understand the methods of science, the influence of science on human life, and the main scientific facts concerning the nature of the world and of man.* Science and the rapid advance of technology obviously go hand in hand. Industrial arts draws its basic instructional content from the world of industry, and its materials and processes, as well as from social and economic considerations brought into focus by our industrial and technological age. The approach to all

activities in industrial arts is basically that of analysis and operations in planning, organization and procedures, and measuring and evaluating results. Tangible evidence usually remains in the form of a product or project indicating the degree of success attained by the student or the group. An understanding of industry and the organization of industry, which industrial arts attempts to teach, should normally point to the place and importance of various aspects of science and develop a measure of understanding of science and the influence of science on human life.

7. *All youth need opportunities to develop their capacities to appreciate beauty in literature, art, music, and nature.* Elsewhere in this book the conviction has been expressed that participation is the best basis for appreciation. This seems to be true whether the problem is weaving a rug, making a vase, painting a picture, or playing a violin. If this is true, then development in capacity for appreciation in certain aspects of art may well be a result of the industrial arts program. Many simple experiences may be offered where the student can feel released from restraint and minute directions and have the satisfaction of creating something of his own imagination. Another way of contributing to this need would obviously be to expose students to beautiful surroundings in the classroom, artistic displays of projects, designs, and paintings; take excursions to museums and good furniture stores; the use of still films showing art in buildings, sculpture, pottery, weaving, and similar articles.

8. *All youth need to be able to use their leisuretime well and to budget it wisely, balancing activities that yield satisfactions to the individual with those that are socially useful.* No one would probably want to relieve industrial arts from the responsibility of rendering service to this need. There can be no doubt that it can be served through the industrial arts program. An objective pertaining to preparation for worthy use of lei-

sure has been emphasized in our literature for many years. Again it would be a mistake to think that any kind of program and class procedures would stimulate interest in future continuation of shop activities any more than that compulsory study of literature will automatically lead to a taste for good reading materials. Obviously a requisite for such result would be that the experience in school be made enjoyable. And while it is probably true that the industrial arts program has an appeal to students beyond many others, there is still room for improvement. Whether the phenomenal increase in the use of home workshops for leisuretime use can be attributed to the almost universal exposure to industrial arts by present home owners has probably not been determined, although it would seem likely that the basic knowledge of the use of tools in the school program has had a great deal of influence in connection with the movement.

9. *All youth need to develop respect for other persons, to grow in their insight into ethical values and principles, and to be able to live and work coöperatively with others.* It has long been claimed that industrial arts furnishes superior opportunities for experience through group organization, coöperative use of tools and materials, and an informal work atmosphere conducive to social adjustment. This claim is probably justified. The very nature of the industrial arts program is such that these opportunities will exist, and in most cases the group is so organized that some visible results are obtainable. Whenever the teacher is taking advantage of the inherent opportunities for giving class members important parts in class management and other duties, these values are enhanced. The use of foremen, tool clerks, tool checkers, materials clerk, finishing room superintendent, clean-up supervision, etc., leads to the necessity for coöperation and feeling of belonging to the group. Organized mass or group production of school or community projects enhances the opportunities in this regard.

10. *All youth need to grow in their ability to think rationally, to express their thoughts clearly, and to read and listen with understanding.* The industrial arts teacher has unique opportunities to serve youth with reference to this need. The end product of industrial arts teaching is usually a project made with tools and materials. Under the best practices at least the following procedures would be involved on the part of the student: (1) selection of project after investigation of possibilities, (2) making a detailed drawing to scale showing all dimensions, (3) making a bill of material showing sizes and cost of each part, (4) making list of steps of procedures and operations for the job, (5) actual construction, (6) selection and application of finish, (7) self-evaluation by the student of his acquisition of knowledge, his personal development, and the success of his job.

All these procedures will require rational thinking, decision, accuracy in drawing conclusions, ability to retrace and review a line of thinking, judgment concerning structural problems, tool operations, and routing of the work. A valuable aspect of the procedure is that mistakes in thinking will show up as failure in construction and cannot be hidden or covered by rationalization.

PROBLEMS AND QUESTIONS

1. Make a list of goals or objecttives for industrial arts which you think are important but which are not listed in this chapter.
2. Do you consider leisuretime crafts and hobbies to be more or less important than a generation ago? Why?
3. Show in detail how the "maturing of work habits" can be accomplished through industrial arts.
4. By what procedure can safety habits in the home be developed in industrial arts?
5. Make a list of advantages that you think might come to a person in adult life from becoming acquainted with fundamental principles of good design in the school shop.

6. List twenty-five situations in which you think a person would profit in later life from the degree of judgment in purchasing and using industrial products that you would expect to be developed from industrial-arts work.

7. How would you reorganize the ten goals listed in this chapter for greater simplicity?

8. Do you think the goals presented in this chapter are equally suited to all communities?

9. In your opinion are handy-man activities more or less important now than formerly in American life?

10. Show in detail how the seven objectives in the "Cardinal Principles" may be served through industrial arts.

11. Do you think that the "Imperative Needs" will tend to become obsolete? Give reasons for your answer.

12. Do you believe that honesty, perseverance, industry, etc., are developed through industrial arts? Give reasons for your belief.

13. To what extent do you think that industrial arts has special values for personality adjustment that many other school subjects do not have?

14. What reasons can you give for the fact that girls have not more generally been encouraged to take industrial arts?

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Chapter XII

SOURCES AND SELECTION OF SUBJECT MATTER

The Search for Subject Matter

After a set of goals or objectives has been stated and accepted, a next logical concern will normally be the problem of locating and organizing suitable content and subject matter for the attainment of these goals. The statement that industrial arts is a part of the total program of general education has been repeated and emphasized in earlier chapters of this book. Having accepted this concept and the set of goals listed in the previous chapter or a set of similar goals, where can the teacher or curriculum maker turn for materials that may be embodied into courses of study and teaching content leading toward the attainment of these goals?

Industry as a Source of Teaching Content

If it is agreed that industrial arts is basically a study and investigation of industry and the impact of industry upon social and economic life, it would seem obvious that the primary source of subject matter for the program is industry itself. But industry has many facets and ramifications and an attempt to discover suitable content or subject matter through this approach will immediately appear either to fall short of satisfying the needs or become extremely involved. One approach here which has been practiced rather extensively has been that of trade analysis, which has been prompted mainly by needs in trade and vocational education. The results have also affected teaching content for industrial arts, particularly in advanced work.

Analyzing Industrial Life

It will soon become clear that a study of operations which skilled workers are expected to perform will throw light upon only a segment of the needed teaching content for industrial arts. How can other phases of industrial life be explored and drawn upon as promising subject matter and content? In answer to this question it would seem that the technique of analysis might well be applied to a number of areas or phases of industry in addition to tool processes and operations, from which ultimately may be combed out valuable and suitable content to serve a larger number of our stated aims. Some of these are suggested in the following listing, with brief comments for each.

1. *Production of goods from raw materials.* An analysis of production and production techniques requires a different viewpoint from trade analysis. While skill in the use of tools and machines would be involved, such aspects would be only a small part of the total problem.

2. *Mass production and automation.* This should prove to be a fruitful area leading (a) to teaching content for understanding industry and (b) to possible organization of group projects in class so that students would get experience indicative of that offered in industry.

3. *Managerial practices.* An analysis in this area could lead to subject matter for helping students to become acquainted with the relationship between management and labor, as well as to appreciate future applications of practices provided in the school shop.

4. *Organization of industry.* The complexity of modern industrial organization cannot well be presented haphazardly with good results in the limited time available. The application of the analysis technique should furnish a number of items which may later be selected and refined for proper use. Fig. 43 pictures a visit to a manufacturing plant.

5. *Human relations problems.* This phase of analysis might involve personnel problems within industry as well as problems of labor relations and a study of arbitration procedures, sales, and many other problems.

6. *Designing and planning.* An analysis in this area might include processes of obtaining patents, design of the product, specifications, lofting, cost estimating, and similar elements. Eventual instructional units resulting from this analysis should apply directly to work in the industrial arts shop. See Fig. 44.

7. *Materials of industry.* A listing here could include both raw and processed materials used in manufacture and construction. Such a list would furnish a reservoir of available content from which ultimate teaching units or information for use with demonstrations would be drawn.

8. *Advertising and distribution of goods and services.* Modern advertising is a very real adjunct of our technological age. Systems and means of distribution affect occupational and social life of a large number of people. An analysis of advertising and merchandising techniques should result in some valuable lesson materials suitable for industrial arts classes.

9. *Consumption and use of goods and services.* Intelligent consumption has been included in most lists of industrial arts aims for many years. Very little has been done to segregate and organize teaching content for realizing the aim. An analysis of possibilities here might lead to more conscious effort in this direction.

10. *Occupational requirements and opportunities.* This area of subject matter has received considerable attention and possibly needs little if any original analysis from raw data. There may be situations where there is need for local investigation. There would, however, be need for analysis of available literature and information before actual teaching units could be selected for the particular class or age level concerned.

No attempt will be made here to indicate procedures in de-

tail for making these analyses. Two sources appear to be available: (1) written material covering the various areas indicated, (2) personal visitation of the situations involved. The degree of detail of the analyses would, of course, depend upon conditions causing it to be made. The analysis should be as thorough as possible, listing many more items than will be used in the final course of study.

Other Sources of Subject Matter

While extensive analyses of most of the areas indicated in the previous paragraphs have not been carried out in detail for use in industrial arts teaching, there are, however, many existing sources of organized content basically useful to the teacher in search of subject matter for industrial arts classes. If these sources can be tapped, the material obtained will serve the same purpose as original investigation, so far as the listing of possible items or teaching units is concerned. Much of this type of material is available in printed form, while in some cases personal visitation may be necessary in order to get the necessary information. The following are a number of sources:

1. *State departments of education.*
2. *Office of Education, Washington, D.C.*
3. *National teachers' organizations.*
4. *State organizations of teachers.*
5. *Professional journals.*
6. *Curriculum books for the field involved.*
7. *Textbooks and manuals.*
8. *Material from manufacturers of school equipment and supplies.*
9. *Visits to schools and school systems.*
10. *Attendance at meetings and conventions.*

Other sources not falling directly under this classification are:

1. *Home maintenance and do-it-yourself needs.* These can be analyzed by surveys of home owners, student reports, etc.

2. *Leisuretime needs.* A study of adult education programs, of home workshops and equipment, and of recreational and vacation activities would help to indicate possibilities for meeting these needs.

The foregoing is not intended to be an exhaustive treatment of possibilities in the search for subject matter for industrial arts, nor the only approaches to the problem. It would seem, however, that any subject matter or content considered should be subjected to analysis and selection in the light of chosen and accepted objectives and other limiting conditions and should contribute to the attainment of those objectives and conditions.

The analysis suggested so far would normally result in a random listing of segregated items obtained through the investigation carried on. These listings would probably contain many more items than would ever be used in the classroom. It seems best not to attempt to arrange the items in order of importance or in orderly groupings when the original listing is made. This procedure applies to the treatment of collected written or published material, as well as to items obtained from conversation or conferences. The written material, whether it be books on industrial organization or items from courses of study, would be scanned for pertinent material and every promising suggestion noted. Using cards and listing one item on each card will save time later when proceeding with the additional steps in the selection of items for use in the course of study and for teaching units.

Selecting Content from the Analysis

The listings of items that will result from this first step in analysis are obviously not valuable for immediate use. The second logical step is to make suitable selections, from these listings, of those items that appear useful as instructional content in the course contemplated. And here some bases for se-

lection will be needed. Such basic considerations would involve at least the following:

1. A statement of general objectives for the industrial arts program.
2. Detailed objectives for the course in question.
3. Age of students.
4. Previous experience.
5. Time available in course.
6. Future plans of students, particularly at the high school level.

With this information on hand the selection of items of subject matter can go forward. The best procedure will probably be to go through the cards or the lists available and pull out each item that appears suitable for the particular class and course in question. No attention is paid to *sequence of arrangement* of the items at this time. Items not used for this course may, of course, be useful when selecting subject matter for some other course or courses.

Arranging Content in Instructional Order

The third step in the process of obtaining organized content is the *arrangement of the selected items into a correct sequence for instructional use.* If the card system is used this will be a simple process. Such a set of items logically arranged would then be basic material for the instructional content in the course of study. The preparation of courses of study will be discussed in the next chapter.

Subject Matter in Elementary Schools

While no attempt is made in this book to treat comprehensively the work of the grades below the seventh, a brief discussion of subject matter for industrial arts in elementary schools may be helpful.

In the organization of industrial-arts activities in the grades

below the seventh, formal work with tools and materials is less and less favored. The woodworking program that once was common has given way to a large extent to other types of activity with less demand for skill in the doing and more direct relationship to the study program of the classroom and to the life of the child. This means also that the special teacher of shopwork is less used in these grades, and that the activity carried on usually comes under the instruction and supervision of the regular classroom teacher. Special teachers are prone to feel that this is a lowering of standards of work, and probably a means for developing poor habits in tool manipulation. In some larger schools special rooms are used for the industrial-arts activities, with a special teacher in charge; but in modern settings these activities are not confined to formalized work. The equipment of such rooms may include a variety of possibilities.

Projects for Industrial Arts

The term "project" in industrial arts is usually interpreted differently from the meaning given to it in connection with projects and the so-called "project method" of teaching in other areas of instruction. In industrial arts a project has come to be thought of generally as the visible product of construction activity in the form of articles made or jobs completed. The question might well be raised, however, whether this definition of the project may not be too limited under our present concept of the place and function of industrial arts in the curriculum of the school. In elementary schools industrial arts is considered mainly an integrated part of the social studies program. Construction work is used to lend meaning and reality to the study or unit under consideration. In secondary schools the approach is usually reversed. Here "projects" are assigned or selected, and the assumption is usually that, during the construction of the project, related technical, and other

types of information and investigation content will be injected or "sandwiched in" as construction progresses. Thus the project is traditionally the central point of emphasis and concern in the program.

While it is true that the major portion of time in industrial arts is used in actual construction, and that the sustaining interest of students centers around the project as an outcome, it is possible to picture teaching situations in this field where the approach would be similar to that used as indicated for the elementary school. Let us assume, for instance, that a class should become interested in a study of organization and efficiency in industry as a starting point and would decide to make an application of findings to their own school shop. Such a study could logically lead to a great deal of manipulative activity which might involve design and construction of tool cabinets, racks for materials, charts for recording progress, student management charts, painting and decorating, and other similar experiences. Such a "project" might originate through a desire to learn about industry and industrial methods and then lead to manipulative activity on the part of the students. Another situation might develop where a study of materials might be undertaken, let us say, in the metal shop. The manipulative work involved might be confined to experimentation and laboratory techniques only. Still the undertaking would presumably be classified as a "project" in the school shop.

Classification of Projects

From the standpoint of class organization and teaching procedure, projects may fall into several different classifications. The following will indicate some of these:

1. *Individual projects.* This type of project is carried out by the individual student. All operations and processes are performed by a single person. The finished article may or

may not become the property of the student, but he is responsible for all phases of the work involved.

2. *Group projects.* A group project as here interpreted is participated in by several students or a whole class. A bicycle rack for the school grounds would be an example of such an undertaking. This type of project offers many opportunities for realizing the broader objectives for industrial arts not inherent in the individual project. The connotation of the term "project" here could also cover services performed, as for instance, decorating and lighting the stage for plays, school photographs, reconditioning sound and projection equipment, etc., as well as new construction work. Classes may be so divided that a section of the class works on group undertakings by rotation while the remaining number is engaged in other work.

3. *Mass production projects.* Mass production projects are similar to group projects in many ways. They differ, however, in that they offer opportunities for simulating methods of production in industry and will give participants a limited view of mass production techniques. A project of this type is described in greater detail in Chapter IV. Another such project is pictured in Fig. 45.

Practice in Assigning Projects

The assignment of individual projects or problems for construction in the school shop has been approached in different ways by different teachers. Of these, three methods will be reviewed briefly as follows:

1. *The "no-choice" method.* The practice of assigning the same projects or articles to all students is the oldest of these methods. In fact it was used almost exclusively in the early days of shop teaching. A set of "models" or exercises based largely on "sequence of tool processes" was prescribed and adhered to. The custom came with the importation of Swedish

sloyd and the Russian system of tool instruction. The practice may still have some merit, particularly for the initial assignments in a course; but can hardly be justified for extensive or exclusive use under present interpretations of objectives and teaching procedures.

2. *Choosing from groups of projects.* As the program of shopwork developed it became evident that the assignment of single compulsory problems or projects to all students had serious limitations. It was recorded by Bennett [1] that the constant difficulties encountered by the instructor in his attempt to keep the class working at the same pace led to a search for some means of adjusting the work to the student instead of adjusting the student to the work. The anxiety to solve the problem of what to do with the fast student or the slow student resulted in the "group method" of organizing subject matter for the school shop. There are, of course, many other advantages in this practice.

This method of grouping subject matter means, reduced to its simplest terms, that instead of one project or article being compulsory for the entire class there is a group of projects or articles ranging in scope or difficulty in construction, and that from this group the student may select or be assigned one which conforms with his ability to make progress. All articles in the group contain the fundamental processes which the instructor wishes to cover, but some of them will involve more extensive application of these processes, and probably some additional operations which are not considered essential for everyone. It would seem clear that this method will furnish opportunities for students in several ways: (1) to work on a project within their general ability, (2) to choose a project of more interest, (3) to be able to finish the project and still cover the minimum, basic tool processes involved.

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[1] Bennett, C. A., *The Manual Arts*, The Manual Arts Press, Chapter VI (O.P.).

Free Choice of Projects

Some instructors, approaching this subject entirely from the standpoint of student interest, have gone so far as to advocate that students be given an almost unlimited choice of what they wish to make.

While it is unquestionably true that too much stress has been laid upon sequence of tool processes to the extent of discouraging students and destroying interest, it is also true that interest may vanish because of lack of definiteness and of challenging requirements in the program. After all, the majority of students come to the shop as well as to other classrooms with the desire of learning something new and definite, and if they are put to work without a semblance of organization they will soon feel that their time is wasted. The free choice of things to make may sound desirable, but in practice it has not been notably successful. The idea came largely as a rebellion against the lock-step type of organization involving nothing but a so-called sequence of tool processes applied to a set of exercises, but in application it has probably been modified by practically all who have attempted to apply it.

Motivation of Students

A constant concern of the teacher in planning projects is how to stimulate desired motivation of his students. Since interest and personal satisfaction are prime factors for successful work, it follows that the largest possible opportunities for student participation in selection of projects should be given. At the same time the teacher must accept the responsibility of guiding the student in the light of accepted goals and aims. What are some of the qualities and characteristics of adolescent youth that may be brought into play in developing interest in various types of projects? The following are offered as suggestions:

1. *Personal ownership.* The desire to possess things is strong

in adolescent youth. Projects planned to meet conscious needs for personal use, real or imagined, here and now, are most likely to attract the interest of youth as well as of adults.

2. *Love of parents and family*. Gift projects for parents and home stand high in stimulating motivation for sustained effort and desire for perfection in workmanship. They carry with them an expectation of approbation and acceptance so dear to both young and old.

3. *Assisting the unfortunate.* In response to suitable appeal most youth will respond to opportunities to do things for those who have suffered misfortune. Toy repair and manufacturing for underprivileged children, furniture for families in distress from fire or other disasters, and similar needs can and usually will become matters of great concern to youth of secondary school age if tactfully presented.

4. *Group ownership and sharing.* Equipment for the play lot or for the hide-out in the garden or for the "boys' club" is usually of great interest in early adolescence. Such projects prompt a desire for good workmanship in the bid for approval by the "gang."

5. *School projects.* There is a justifiable tendency on the part of teachers to shy away from school projects because of undue pressures that are often exerted for work which has little or no educational value. Nevertheless, the school is the student's present community of which he is a vital member. Legitimate school projects, if properly presented, can become valuable in serving many of the accepted objectives of industrial arts. Projects correlated with dramatic productions, sports, and exhibits, are typical examples.

6. *Civic and community projects.* Preparation for active citizenship is a responsibility of all areas of education. Some projects successfully carried out by industrial arts classes are: equipment for summer recreation and crafts programs in city parks, wood and metal signs for youth recreation buildings

and other locations, furniture for boy scout troop meeting places, and many others.

The various types of projects discussed here and similar ones can be organized under the different classifications of projects—individual, group, and mass production, discussed previously. If conducted in the light of the various objectives for industrial arts, it will be found that such projects are rich in opportunities of bringing to the front many of the much-neglected aspects of the program.

Desirable Characteristics of Projects

Planning and construction of the projects normally consume by far the largest part of the student's time. They are the "vehicles" through which interest is maintained and through which his educational and social growth is nurtured. If this is true the need for careful and analytical procedures in selection becomes evident. Too little attention is often given to this important task. Projects have been kept in school programs long after their usefulness has vanished. Roller towel racks are still in bathrooms, and probably being made, while a roller towel is seldom found. Projects made by prospective teachers in college are carried away by the graduate—as they should be—and taught to secondary school students for ten or twenty years—which they should not be.

It should be said, however, in all fairness, that many good ideas for projects have been made available in recent years, displaying both better design and more suitable requirements in tool techniques and craft process. Teachers have better preparation in design and, while most of them may not be able to produce good original designs, more know how to reject the bad and point out the good to their students. Students should be guided toward an ability to appreciate good design and some of them will be able to contribute in developing new or altered designs of school projects. Every project

BOWLING GREEN STATE UNIVERSITY, OHIO

FIG. 43. Visits to manufacturing plants are valuable experience for prospective industrial arts teachers.

KANSAS CITY, MISSOURI, PUBLIC SCHOOLS

Fig. 44. The making of model homes may well result from a study of planning and designing in industry. It is also of practical value to future home owners.

SANTA BARBARA CITY SCHOOLS

FIG. 45. A production job such as this in the junior high school will lead to an understanding of mass production methods in industry.

KANSAS CITY, MISSOURI, PUBLIC SCHOOLS

FIG. 46. A Do-It-Yourself exhibition in cooperation with community agencies will stimulate interest in home workshop activities and in adult offerings in the schools.

should be scrutinized for suitable qualities and characteristics before being released to the student. The accompanying checklist for evaluating projects for industrial arts is self-explanatory.

SUGGESTED CHECK LIST FOR INDUSTRIAL-ARTS PROJECTS

Name of Project.. Type of work or shop....................
Grade Level.. Previous Shop Experience....................
Length of Course..

Items for evaluation *	1 = Highest rating; 4 = Lowest			
	(1)	(2)	(3)	(4)
1. Is project based on student interest?	( )	( )	( )	( )
2. Does it serve several objectives for industrial arts?	( )	( )	( )	( )
3. Is it suited to grade and age level?	( )	( )	( )	( )
4. Will student find project satisfying when finished?	( )	( )	( )	( )
5. Is it within ability of student?	( )	( )	( )	( )
6. Is it suited to time limitations?	( )	( )	( )	( )
7. Is project well timed?	( )	( )	( )	( )
8. Will it challenge student effort?	( )	( )	( )	( )
9. Does it allow for student planning?	( )	( )	( )	( )
10. Is it well designed?	( )	( )	( )	( )
11. Will it introduce new experiences?	( )	( )	( )	( )
12. Is suitable material available?	( )	( )	( )	( )
13. Does it involve cooperative experience?	( )	( )	( )	( )
14. Is it limited in size to available work space?	( )	( )	( )	( )
15. Is it reasonable in cost—for student or school?	( )	( )	( )	( )
16. Is needed equipment available?	( )	( )	( )	( )
17. Is there locker space available for materials?	( )	( )	( )	( )
18. Will it call for learning as well as tool operations?	( )	( )	( )	( )
19. Are required operations safe for the age of students?	( )	( )	( )	( )
20. Will project stimulate thinking and creative expression?	( )	( )	( )	( )

Remarks:..

....

General rating of project: 1.................. 2.................. 3.................. 4..................

* It would normally not be expected that all satisfactory projects should rate equally high on all points.

PROBLEMS AND QUESTIONS

1. Are there situations in which industry and real life are not reliable sources for furnishing subject matter for the school shop?

2. To what extent should the cost of the installation be taken into consideration when planning to introduce new subjects?

3. To what extent do you consider it logical to use leisuretime interests of poeple as a source for teaching content in industrial arts?

4. Make a list of activities that industrial-arts teachers may carry on in order to keep their teaching content up to date.

5. To what extent should occupational-training content be considered for industrial-arts courses?

6. Name some shop activities that do not represent a sufficiently broad field to justify themselves in the school curriculum.

7. What subject matter would fit into a program stressing self-activity in the elementary school?

8. What values do you see in studying methods of industrial production in classes in industrial arts?

9. Name some subjects for which materials would be too expensive.

10. To what extent would you insist that an industry represented in school should be inportant in the community?

11. Are there any inherent dangers in a rapid expansion of subjects in the shopwork program in the schools? If so, what?

12. If a survey of home-mechanics activities of parents were made, to what extent would you consider it valuable in furnishing subject matter for a home-mechanics course?

13. How can one justify the practice of going to industry for subject matter for industrial arts when it is conceded that industrial arts does not train for employment efficiency?

14. Make a list of twenty-five instructional units or operations that would be suitable to rural schools.

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Chapter XIII

MAKING COURSES OF STUDY

The Course of Study

A course of study is essentially a guide for the purpose of assisting the teacher in his daily routine. In its simplest form, it may consist of a skeleton outline of topics to be covered in some suggested sequence, with perhaps the addition of assignments and student activities. From this point on it may be expanded to include a great variety of directions, suggestions, and information regarding the teaching process and many other matters more indirectly related to the classroom procedures. A course of study is differentiated from a curriculum principally in that the former pertains to organization of material for a single subject for a definite grade or age level. A curriculum, on the other hand, has to do with groups of courses covering larger segments of subject matter areas or fields, or a series of courses arranged sequentially for a single field. A *course of study* might be produced for electricity for the eighth grade. The industrial arts curriculum would deal with not only all courses in electricity, but all the courses offered in industrial arts, such as woodwork, drawing, metalwork, and graphic arts.

Procedure in Making Course

Much of the basic procedure and material entering into the making of a course of study has been discussed in previous chapters. Traced through its various stages, the making of a course of study may involve the following processes:

1. *Statement of definite objectives and goals for the activity contemplated.* This will involve not only general goals for

industrial arts, but the addition of specific outcomes sought, based upon such factors as the subject considered, age of students, time allowance for the work, physical setting, available equipment, and previous experience of students. Care should be taken not to list objectives at random and hope to serve them. It is better to concentrate on definite goals for main emphasis and be able to do something worth while toward their attainment.

2. *Making an extensive analysis of possible teaching content.* The procedure for this has been discussed in Chapter XII and need not be repeated here. The extent of the survey for suitable content would of course depend again upon the specific objectives determined upon. The analysis would cover not only content pertaining to operations and related technical material, but subject matter that would serve at least a number of the less recognized aims.

3. *From the total listing, select at random those items that appear to be feasible for the course being planned.* At this point, length of time, ability of students, physical facilities, and the specific objectives will again be determining factors. This list will now contain the selected items without reference to ranking or order of use.

4. *Organize the items in instructional sequence.* This process may involve grouping items under various headings for final use in course outline, as: operations, processes, technical information, related studies, occupations study, etc., depending upon the format and organization to be used. When this job is completed the items will be arranged on cards or sheets of paper in the order in which they are expected to be introduced, although they might again be readjusted when finally put into the outline.

5. *Organize the selected materials into the format of the course of study.* This material will now furnish the major part of the main body of the written course. It will become

the part of the source from which instructional units will be drawn. Possibilities for the mechanical arrangement of this body of content in the course will be discussed in later paragraphs.

Preliminary Considerations

The body of content discussed up to this point is obviously the principal substance for the course of study. But it is by no means the total fabric from which a comprehensive course of study is made, for many other types of material are usually drawn upon before the final assembling of the instructional content is undertaken. The following are some of these:

1. *Title page.* This page gives the exact title of the courses, the school or school system where course will be used, the grades or school level for which the course is planned, and the date of publication.

2. *Acknowledgments and recognition.* This will involve names of persons and committees who have worked in the production of the document and also a listing of administrative personnel under whose direction the work was done.

3. *Table of contents.* Some types of brief course outlines may not require a table of contents, but it should be kept in mind as a regular feature of comprehensive course construction.

4. *General statement of philosophy and viewpoint.* Los Angeles courses of study appearing under the title of "Instructional Guides" present such material under the heading of "Our Point of View."[1] Subdivisions under this heading are: "Exploring the Industrial Arts," "We Believe," and "Definitions." Other topics presented in this section are treated under the headings, "Basic Skills," "Mathematics in General Metal,"

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[1] *Instructional Guide for General Metal, Junior High School Industrial Arts,* Los Angeles School Districts, 1954.

and the "Relation of Industrial Arts to Vocational Education."

5. *Objectives.* These may be expressed in statements of two different types: (1) a general expression of aims and purposes for the educational field or area represented, and (2) a presentation of specific goals, outcomes and experiences inherent in the specific course to be offered. The second of these is often used as introductory material to the main body of the course which contains the various phases of teaching content. In a California State course of study,[2] this material is so presented in three paragraphs under the headings of "Emphasis," "Outcomes," and "Characteristics of the Course," respectively.

The list of these preliminary or introductory aspects of the course is not exhaustive, but will call attention to the major elements of an introductory nature. From this point on the emphasis will be on the instructional phases of the teacher's job which will logically constitute the main body of the course of study.

Basic Approaches in Organizing Course Content

When confronted with the task of organizing subject matter and instructional procedure in the course of study for industrial arts, the course maker faces a real task. What factors or avenues of approach should determine the starting point? The approach to the problem may be made from several basic viewpoints. The following will indicate some of these.

1. *Student interest or need.* Interest as a factor in the educative process has been emphasized to the point that it has been given first consideration in organizing teaching material into courses of study. Or it might be nearer the truth

[2] *Suggested Courses of Instruction in Industrial Arts for the Junior High School Level,* California State Department of Education, Sacramento, California, 1953.

to say that it has been emphasized to the exclusion of a tangible course of study. Under the cover of real or pretended zeal in approaching the subject of industrial arts through the avenue of student interest, much wrong can be committed against youth and sane teaching procedures. Student interests and student needs are not necessarily synonomous. "Needs of students" constitute a legitimate and major basis for an approach to curriculum making. Recognition of such "needs" should lend a healthy atmosphere to course construction in industrial arts.

While shifting interests of students may be dangerous as the controlling factor in selecting and organizing subject matter, it nevertheless is true that subject matter should be tested by the measuring rod of student interest, and if there is no chance that it is or can become interesting, this fact alone should suggest its omission or reorganization.

2. *Projects or articles to be made.* If the free or near free choice of projects is practiced, this approach might be a logical one. It was in practice in the early days of sloyd teaching in elementary schools, although the models upon which it was based were usually compulsory and allowed for no choice. In this case the articles to be made were arranged in a series, in ascending order of difficulty, involving what was assumed to be a logical sequence of tool processes.

3. *Sequence of tool processes.* Historically this is the old established form of approach. It was practiced in its most rigid form in connection with the use of graded series of exercises and practice jobs. The entire program was based upon progressive tool practice and techniques. While modern concepts of teaching industrial arts have discredited the practice exercise for its own sake, the listing of tool processes has persisted, with some justification. When this approach can be coupled with suitable projects, it furnishes a basis for orderly planning.

4. *Learning facts, or acquisition of knowledge.* This approach has been generally adopted in elementary schools. Where formerly the industrial work even in the lower grades involved the formal construction of articles by individual students, these activities are now guided toward interpreting and vitalizing work in units of social studies, expressions of arts and crafts of primitive people being studied, and similar projects. This approach might well be pursued for the secondary level and would coincide with suggestions offered in the previous chapter and later in this chapter concerning the investigative approach to the study of industry as compared to the construction approach.

5. *Future usefulness or adult needs.* For the general home-mechanics shop, particularly, surveys have been made in order to determine the frequency of future demands upon tool and operational skills. The frequency of the recurrence of repair jobs and other home services in a large number of homes over a long period may be used as the determining factor in arranging jobs in the course of study. The great expansion of activities under the "do-it-yourself" slogan has magnified possibilities for both teaching content and personal interest. A number of the commonly accepted goals for industrial arts can receive special emphasis under this approach, including intelligent selection and consumption of goods and services, and appreciation of good design. See Fig. 46.

Other Considerations

Examples of other approaches used as bases for the pattern of organization of teaching content in the course might be (1) investigation of industry and occupational distribution of workers in the community, (2) general attitude of the community toward its educational program, (3) future normal educational needs of majority of students.

The foregoing is not meant to indicate that any single factor

or approach mentioned is likely to be used alone and to the exclusion of all the others. The question will be mainly one of emphasis, both in the mind of the course maker or teacher and in the physical arrangement of teaching content in the course.

Forms and Formats Used

Most courses of study are put into the form of booklets or folders with page sizes varying from 6″ x 9″ to 8½″ x 11″. For certain types of course material, the card file system may be used to advantage, particularly where the principal interest is in the course material useful for daily teaching. But for the comprehensive type of course the book form in the size of 8½″ x 11″, appears to be favored.

Further Steps in Course Construction

Assuming now that the preliminary statements as previously discussed have been made either in rough or final form, the next step will be to make a plan for organizing and arranging the remaining parts or sections of the course. These sections might include all or most of the following:

1. *The body of teaching content.* This will involve arrangement of content in some selected form showing what students are expected to learn and experience and the various means by which the prescribed learning and experiences may be acquired. Some techniques involved here are illustrated in accompanying sample pages.
2. *Suggested projects.* Most courses will furnish lists of suggested projects or activities which would be suitable for the type and level of learning indicated.
3. *Instructional aids.* This section will indicate types of aids which may be used and sources for obtaining them; motion pictures and procedures for requisitioning; wall charts; and available sources.

4. *Methods and instructional techniques.* Here suggestions may be made concerning special teaching procedures, use of demonstrations, assignments, evaluation and testing, and others.

5. *Guidance and occupational information.* This section may indicate to what extent the industrial arts teacher is expected to assist in general and occupational guidance in keeping with policy of school. A more detailed discussion of this subject is found in Chapter VII.

6. *Safety instruction.* Here attention is drawn to the need for constant attention to the teaching and practice of safety and to regulations that must be followed in case of accident. Chapter VI is devoted to a discussion of this subject.

7. *Class organization and management.* For this section the Los Angeles *Instructional Guide,* to which previous reference has been made, covers suggestions under the following headings, (a) orderly arrangements of the school shop, (b) tools, (c) supplies, (d) attendance check and roll call procedures, (e) management and student personnel organization, (f) shop records.

Materials of the type contained in items 4 to 7 in the foregoing may be interspersed with the content of the main body of the course or it may be more adequately treated in separate sections as is done in the Los Angeles bulletin.

Arranging Teaching Content

The arrangement of the material of the main body of instructional content is admittedly the most difficult task involved in the making of the course. The plan to be followed will depend upon which of the several approaches discussed are accepted as basic. Determining objectives for industrial arts in general and more particularly the singling out of specific objectives to be stressed would be necessary prerequisites in addition to other factors.

Three possibilities of organization are shown in accompanying charts. The first of these, Fig. 47, is a page from the California state bulletin, *Suggested Courses of Study in Industrial Arts for the Junior High School Level*, compacted somewhat to save space.

The second, Fig. 48, is an original arrangement in support of the emphasis which has been made in previous chapters upon the need for giving more serious attention to some of our accepted objectives which are not in the foreground when tool operations and related technical information are used as starting points. This arrangement is made with the goal of stressing understanding of industry as the starting point. It should not be inferred from this presentation that all teaching in industrial arts must necessarily be based on this approach.

The third chart, Fig. 49, shows a treatment developed from the use of the project as a starting point, and including the listing of tools and material, steps of procedure, and references. This style also renders informational service to teachers who may not be versed in all phases of the technical work involved.

You will find the above charts, Figs. 47, 48, and 49, on pages 301, 302, and 303. Emphasis must be given the fact that all such prepared material can be altered by your local situation.

Lesson Planning Necessary

Regardless of the type of course of study used, it will be necessary for the teacher to break down the items listed into small teaching units and plan each of these units separately for presentation to the class. And in these presentations he can use an endless variety of techniques and aids to keep the subject fresh and alive. The course of study may be the same, but the projects, the approach, the point of contact, and the visual and other teaching aids need not be the same. Lesson planning was discussed in detail in Chapter II.

GENERAL METAL (Level II, Basic) *

Activities, Skills, Processes

Planning

Interpret working drawings
Make sketches of projects
Select and design projects
Compute quantity and cost of materials for projects
Plan operational procedures
Layout with scriber, combination square, center punch, dividers, and hammer

Fabricating

Shear sheet metal with snips, chisels, and squaring shears
Saw metal with hacksaw, jeweler's saw, power hacksaw, and band saw
Drill, countersink, and counterbore with drill press and drill motor
Form threads with taps and dies
Bend and twist hot and cold metals
Forge hot metal
Harden, temper, and anneal basic metals
Temper foundry sand
Ram mold for split pattern
Melt and pour casting metal
Grind metals

Assembling

Solder brass, copper, galvanized iron, and tinplate
Rivet sheet metal
Fasten metal with screws, bolts, nuts, washers, and rivets

Finishing

Paint and lacquer with brush and spray gun
Color with heat and chemicals
Clean and polish with coated abrasives, steel wool, and compounds
Buff with power buffer
Etch with acid and base solutions
Planish metal surfaces
Electroplate metals
Apply novelty finishes: flock, wrinkle, hammertone

Special Information

Safe practices in the use and care of tools, equipment, and supplies
Elements of good design
Machine operations and limitations
Metal identification
Methods of holding materials for fabrication
Kinds of snips and chisels and applications
Metal cutting saws and blades
Drill sizes, types, speeds, feeds, and lubricants
Types of files and their application
Thread forms and specifications
Forming characteristics of basic metals while cold and hot
Forging tools and equipment
Heating and melting furnaces
Properties and qualities of foundry sands
Pattern characteristics
Casting metals; their melting points and qualities
Bend, twist, and forge allowances
Heat treatable metals and processes
Seams and joints for sheet metal
Hammers, mallets, and forms for shaping metal
Solder compositions and melting points
Fluxes for soldering
Sources of heat for soldering
Wrenches, pliers, and screw drivers
Standard bolts, screws, nuts, washers, and rivets
Paints, lacquers, and thinners
Cleaning and pickling basic metals
Abrasive materials
Buffing materials: wheels and compounds
Testing solutions with litmus paper
Colors available with heat and chemicals
Acids and neutralizers

General Information

Hammers used for surface embellishment
Occupational orientation
Metal sources, production, distribution, and conservation
New developments in metals and production tools
Production machines for mass production in shearing, sawing, drilling, filing, threading, bending, and forming
American economy and production
Types of metal casting: permanent mold, die casting, investment and centrifugal casting
Standards for tools and materials
Heat treating phenomena
Automatic lathes and screw machines
History of tool development
Metals and their uses through the ages
American industrial production through refined measurement, interchangeable parts, and assembly-line techniques

Project Areas

Auto and bicycle accessories
Home workshop tools and equipment
Kitchen utensils and gadgets
Home decorative goods
Jewelry
Garden tools and equipment
Indoor and outdoor furniture
Games, toys, sports, and hobby items
Household repairs

Instructional Aids

Charts, films, models and displays, field trips

* Adapted from *Suggested Courses of Instruction in Industrial Arts*, Calif. Dept. of Ed.

FIG. 47.

STUDY AND UNDERSTANDING OF INDUSTRY AND MASS PRODUCTION

Junior High School—One Semester

Projects or Instruction Units	Study Areas for Information and Understanding	Organization, Management, and Procedures for the School Production Job	Tool Processes, Operations, and Production Techniques	Instructional Aids
I. A MASS PRODUCTION PROJECT. 1. *Objectives:* To assist students in developing an understanding of the processes involved in mass production and its importance to American society, through appropriate investigation and operational experience. 2. *General Approach.* The project will involve investigation of mass production through literature, actual visits of industrial plants, and group discussion, applied to a mass production job in the school shop involving 100 or more toy tractors or similar articles made from wood and metal. The project will be handled as nearly as possible by the same production routines as found in industry. 3. Aspects of designing, financing, advertising, shipping, and selling, overhead costs and profits, will be considered. 4. Effects of industrialization upon mode of life will be analyzed and studied.	1. What constitutes mass production? 2. Developmental stages in mass production. 3. Basic elements in mass production. 4. Occupational classification of workers. 5. Automation and mass production. 6. Present mass production techniques. 7. Engineering and mass production. 8. How production industry is organized. Mass production techniques. 9. Sources and handling of raw materials. 10. Production of parts. 11. Machinery used. 12. Organizing the work force. 13. Designing for mass production. 14. Management problems. Organization problems. 15. Personnel problems. 16. Operation of assembly line. 17. Advertising and selling the product. 18. Costs involved in producing goods. 19. Overhead and profit. 20. Effect on standards of living. 21. Benefits to society from industrialization. 22. Social problems created. 23. Mass production and automation.	1. Discuss with class basic methods and approach. Projects based on student initiative, problem solving, creative thinking; student management, group coordination. 2. Appoint· (1) Assistant Manager, (Teacher is General Manager) (2) Designer (Engineer), (3) Research Committee, (4) Materials foremen, (5) Tool Clerk, (6) Inspectors, etc. 3. Design tractor, draw parts in detail. 4. Make model or mock-up. 5. Make templates. 6. Make jigs. 7. Condition tools and machines. 8. Organize groups. 9. Demonstrate tool operations for making parts. 10. Prepare rough materials. 11. Provide for routing materials. 12. Provide for storing and handling of unfinished work. 13. Provide containers for part. 14. Arrange assembly line. 15. Develop inspection techniques. 16. Plan finishing processes. 17. Organize distribution procedures.	1. Making designs and sketches. 2. Making bills of material. 3. Specifying sizes of parts from scaled drawing. 4. Using hand saw, miter saw, jig saw, block plane, try square in shaping wood to required sizes and shapes. 5. Driving and setting nails, boring for and countersinking wood screws. 6. Boring with auger bit and brace, drilling metal and wood with hand drill and drill press. 7. Sharpening chisels, plane irons, and other wood hand tools. 8. Making simple jigs in wood and metal for quantity production of small parts. 9. Operating wood lathe, jig saw, band saw, table saw, sanding disc and spindle. 10. Cutting and forming metal by use of hack saw, file, grinding wheel. 11. Applying stain, shellac, and lacquer, with brush or spray gun.	1. Films, showing production in industry. 2. Organization charts. 3. Personnel assignment. 4. Operational flow chart. 5. Models and mock-ups. 6. Field trips to industry. 7. Charts showing economic changes from advance of industry, periodic improvement in change of design of products, etc. **Evaluation Techniques** 1. Set up criteria for accepted participation and behavior. 2. Use job specifications for all jobs and personnel responsibilities. 3. Use check sheets for student participation in rating efficiency. 4. Place heavy emphasis upon traits and characteristics required in employment in addition to operational skills. 5. Test for evidence of understanding as well as ability to do.

FIG. 48.

COURSE IN HOME MECHANICS

PROJECTS	TOOLS AND EQUIPMENT	PROCEDURE	RELATED INFORMATION	REFERENCES
45 To replace a spring in a mortise lock	Screw driver, vise, pliers, lock spring.	1. Remove the knobs. 2. Remove lock. 3. Remove faceplate from lock. 4. Examine mechanism. 5. Replace broken spring. 6. Oil the moving parts. 7. Replace faceplate and test. 8. Replace lock in door.	1. Material for making springs. 2. How to reverse a lock. 3. Names of the parts of a lock.	1. *Job Sheets in Home Mechanics*—Tustison, #20. 2. *Fix-it Yourself*—Wakeling, pp. 72-3.
46 To mend a garden hose	Knife, pliers, screw driver, hose coupling, clamps, menders, washers or sheet packing.	1. Cut off leaking section. 2. Place clamps over ends. 3. Insert coupling or mender. 4. Tighten clamps. 5. Test hose.	1. Care of hose. 2. Kinds of hose. 3. Materials of construction.	1. *Fix-it Yourself*—Wakeling, pp. 144-45. *Home Mech. Job Sheets*—Tustison, #47.
47 To repair a small hole in a plastered wall	Small trowel, putty knife, mixing board, patching plaster, lime and sizing.	1. Remove all loose plaster. 2. See that lath are intact. 3. Wet the hole. 4. Determine mixture to be used. 5. Mix sufficient plaster for the job. 6. Plaster mixture into hole. 7. Smooth with trowel; brush, or float to match other plaster.	1. Kinds of wall plaster. 2. Kinds of patching materials 3. Plaster finishes. 4. What is meant by "setting" of plaster?	1. *Home Mech. Job Sheets*—Tustison, #48. 2. See also directions on cartons of special patching plaster.
48 To hang a picture	Picture, picture wire, small screw-eyes, punch, picture hooks.	1. Locate position of screw-eyes above center. 2. Punch holes to start screw-eyes. 3. Screw eyelets in firmly. 4. Fasten picture wire to one eyelet. 5. Adjust length of wire to desired height. 6. Cut off excess wire and fasten.	1. Angle pictures should be hung. 2. Height from floor. 3. Use of hangers.	Experience.
49 To make a joint in a round leather belt	Pliers, knife, hammer, punch, wire or 1½" wire brads.	1. Remove belt from machine. 2. Square up ends of belt. 3. Punch holes for connector link. 4. Make new link from wire or brads. 5. Make connection and replace belt.	1. Sizes and uses of round belts. 2. Splicing round belts. 3. Belt dressing.	1. *Job Sheets in Home Mechanics*—Tustison, #11.

FIG. 49. A Page from a Course of Study in Home Mechanics.

PROBLEMS AND QUESTIONS

1. To what extent do you feel that the job-analysis method should determine the selection of material for the industrial-arts shop?
2. Do you consider that "progressive-education" philosophy minimizes the needs for a definite course of study? Explain.
3. Discuss the advantages and disadvantages in approaching the course of study from the standpoint of immediate needs.
4. What is the best general approach for making out a course of study for junior high schools?
5. Discuss this question also for senior high schools.
6. If the teacher has had extensive, practical experience, should he depend upon that experience as a source for teaching content as the work progresses rather than make a definite course of study?
7. To what extent, if any, should pupils participate in making up the course of study?
8. By what means may a teacher keep his course of study from becoming static?
9. Is there danger in having a course of study worked out in too great detail? If so, what is that danger?
10. In what respect would the teacher's previous training and experience determine the type of course of study that he would need?
11. How often do you think a course of study in industrial arts should be revised?
12. Can you recall having seen a teacher do excellent work from all angles without the use of a course of study?
13. To what extent do you feel that "boy interest" should determine content of courses of study?
14. In what form may course-of-study material best be kept for easy revision from time to time?
15. What are some of the values in making groups of teachers participate in producing courses of study?

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Chapter XIV

PLANNING AND EQUIPPING THE SCHOOL SHOP

Evolution of Modern School Shops

The evolution of modern shops and laboratories has gone hand in hand with the expanding philosophy and interpretation of industrial arts as an integral part of the program of general education. The period from the time when a dark room in the basement was considered good enough for the shop class, to the present, when often the most accessible area of the building is devoted to the industrial arts, is a period of encouraging progress and evidence of courageous leadership. Every industrial-arts teacher needs to become acquainted with modern trends and practices in school shop planning in order to be ready to respond to opportunities in connection with planning new shops or remodeling old ones. Following is a brief discussion of various types of shops in use.

The Unit or Single-Activity Shop

The unit shop is the oldest type of school shop. As the name implies, it houses one single type of work, such as woodwork, electricity, automotive work, etc. In modern practices, unit shops are usually found in both junior and senior high schools which are large enough to necessitate a number of industrial arts classes with several teachers employed. Even under such circumstances, unit shop programs are often "enriched" or "generalized" beyond earlier traditional practice, as will be indicated in later paragraphs.

The General Shop

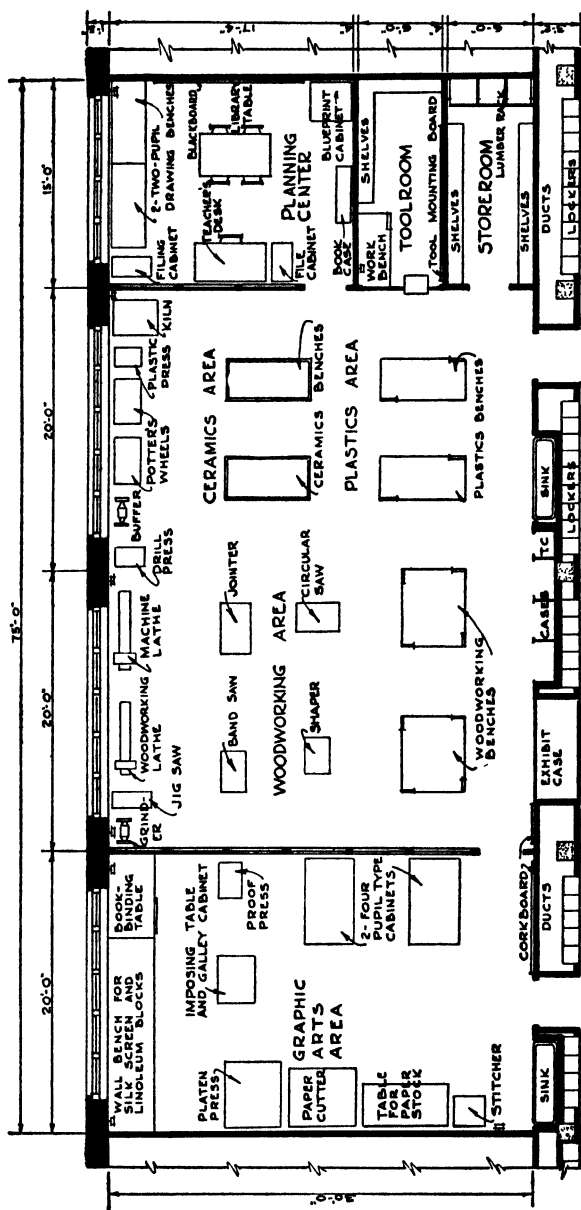
Under the unit shop organization, woodwork came to be

FROM ORGANIZING AND TEACHING THE GENERAL SHOP. LOUIS V. NEWKIRK

FIG. 50. Plan of general shop with provisions for woodwork, metalwork, graphic arts, drafting, ceramics, and plastics.

accepted as the traditional single subject for shopwork in small schools where only one teacher could be employed. Under the broadening concept of aims and objectives of the program of shopwork a gradual expansion of opportunities for experience and exploration became desirable. This need prompted the gradual development by stages of the "general shop," which now exists under a variety of classifications.

The Comprehensive General Shop

A comprehensive general shop is usually thought of as a shop in which several unrelated types of shopwork are taught simultaneously by one teacher. In its most expanded development this type of shop provides for a large number of work areas which may not necessarily all be in operation at the same time. Fig. 50 shows a floor plan of a comprehensive general shop. Comprehensive general shops may be recognized under one of several classifications of which the following indicate types:

1. *The general industrial-arts shop.* This is the most common and the most accepted of comprehensive shops. Under good planning and organization it furnishes the most logical solution toward attaining a variety of industrial arts objectives and goals in the one-teacher shop. The areas which may be explored and experienced are limited only by the capacity of the teacher and by physical facilities for teaching. A rather ambitious plan for a shop of this type might include work areas or work stations for the following: (a) planning, (b) metalwork, (c) woodwork, (d) electricity and communications, (e) graphic arts (including photography), (f) crafts, (g) transportation and power, (h) ceramics, (i) textiles and weaving.

2. *The general home-mechanics shop.* This is one of the older types of generalized shops. It was developed in a desire to liberalize the formal program of the unit shop as represented

by the woodshop with a more or less standardized set of projects. In some cases home mechanics or "household" mechanics program was a gradual development of added work areas or work stations in the woodshop in order that projects involving several materials could be completed in the shop. This added by progressive steps electrical facilities for wiring lamps, metal for use in furniture and sports project, equipment for maintaining and repairing home appliances, and other means of activity.

3. *The farm mechanics shop.* The farm mechanics shop, whether a part of instruction in vocational agriculture, or based upon the industrial arts approach, is essentially a comprehensive general shop. It draws its content mainly from the daily needs and activities of the farm and rural community, although it need not be limited in objective or in activity to the immediate practical needs.

The Limited General Shop

This type of shop may be said to fall somewhere between the unit shop and the comprehensive general shop, in so far as organization is concerned. The implication is that the generalization has to do with "diversification" of an area represented by an industry or craft rather than the combination of two or more unrelated areas. In general metal, for example, related areas involved might be: metal casting, bench metal, sheet metal, welding, art metal, and metal spinning. While some of these areas may be found in separate unit shops, they might well be considered "related" under the general subject of metalwork. General graphic arts would involve not only phases of work formerly taught in a printshop but bookbinding, silk screen work, elements of offset work, and various other forms of reproduction, including aspects of photography and drawing. See Fig. 53. A general metal shop floor plan is shown in Fig. 51.

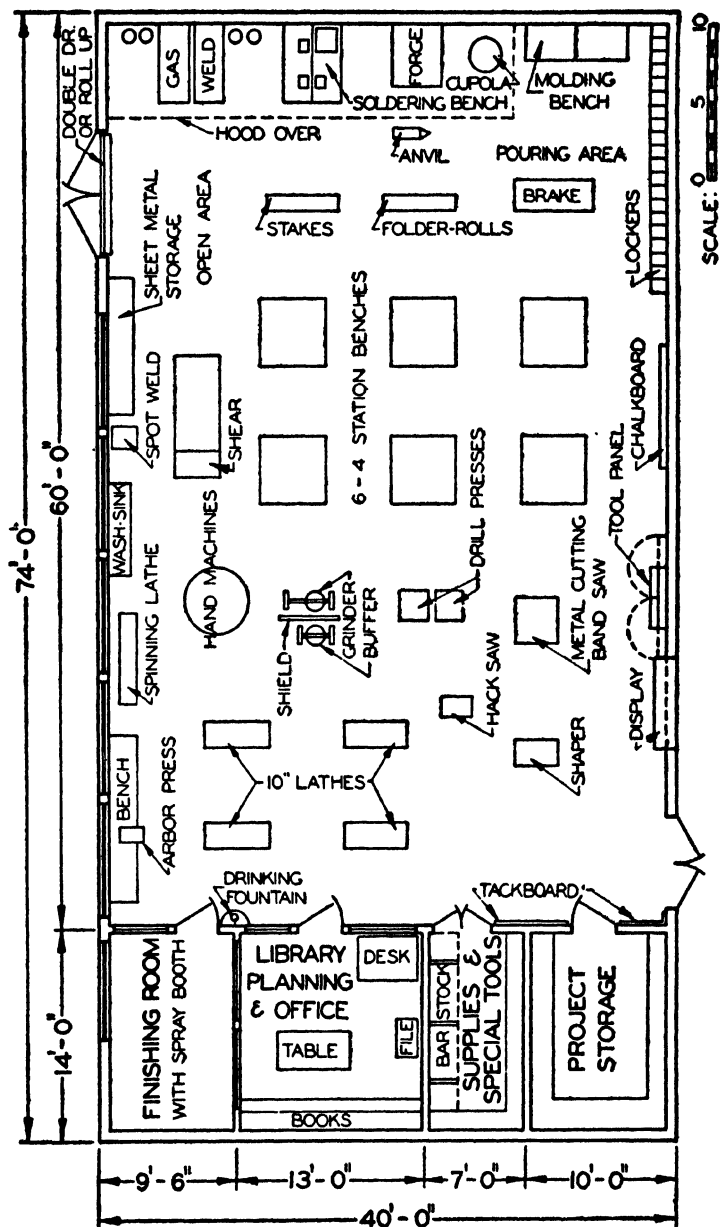



FIG. 51. Reproduced from a bulletin entitled: *Guide for Planning and Equipping Industrial Arts Shops in California Schools.*

The Mobile Shop

The mobile shop has become popular for service to small rural schools. A bus or moving van is equipped with necessary tools and machines for the manipulative work planned. When the shop arrives at the school, some equipment may be unloaded for use in a permanent room while the rear door of the van is lowered as a ramp for entering the "shop on wheels" and working on equipment which is not readily movable. This arrangement answers the twofold purpose of serving various schools with tools and equipment as well as providing additional work space. A mobile shop in operation is shown in Fig. 54.

Planning School Shops

While it is true that good shops and good equipment do not guarantee efficient teaching, it is also true that good physical facilities greatly improve the setting for teaching success. Every industrial arts teacher is likely, sooner or later, to have the opportunity to participate in the planning and equipping of new shops or in remodeling old ones. When that time comes, his effectiveness will depend largely upon the degree of his accumulated knowledge regarding the various aspects of the challenge that confronts him. Such knowledge should be twofold: (1) factual information covering efficient shop planning, and (2) knowledge of how to proceed to impress his views upon those who are in official charge of planning and approving buildings and equipment.

The teacher is the ultimate consumer of the product when his shop is being planned. He need not be too timid to assert himself. But he must do so tactfully and methodically. School administrators who propose policies, school boards who approve them, and architects who plan the buildings will all be glad to have proposals from the teacher, provided that those proposals are sensible, clear cut, and based upon a

knowledge of modern educational practice as well as possibilities in planning the physical plant. And the earlier the teacher presents his views, the better chance he will have of getting a hearing. In presenting needs and requirements for a shop, it is well to make out not only a floor plan, but a complete model showing the layout and placement of all equipment. See Fig. 55.

Floor Space for School Shops

The most common error the teacher is likely to make at the outset is not to ask for enough floor space. After the square footage has been agreed upon, it becomes very difficult to add to it. It is much easier to eliminate space if there should be some to spare.

A good way to arrive at floor space is to segregate the requirements into two divisions: (1) the "open" or "activity" area, and (2) auxilary areas. The first of these will apply to the main part of the shop, which is used for the operational phases of the program, including work benches, machinery, demonstration area, tool cases, lockers, project assembling, etc. The second refers to space used for stock rooms, planning rooms (if separate from shop), washrooms, storage space, finishing rooms, and similar provisions. Considerable study has been made in recent years of needed floor space for school shops. The result has been recommendations for increased space on the basis of the acceptance of modern concepts of the place and function of industrial arts.

An earlier California state bulletin,[1] produced by a large committee of administrators and teachers, divided industrial arts shops into two categories and made proposals for floor space for each. Under the first of these categories, "Heavy Shops," in which wood, metal, and graphic arts are typical, recom-

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[1] *Guide for Housing and Layout of School Shops in California.* California State Department of Education, Sacramento, 1950.

mendations are for the open shop area for 24 students: minimum, 75 sq. ft. per student; adequate, 100 sq. ft.; and desirable 125 sq. ft. This would mean 1,800; 2,400, and 3,000 square feet respectively. For "Light Shops," as typified by drawing and crafts, the following are indicated: minimum, 40 sq. ft.; adequate, 50 sq. ft.; and desirable, 60 sq. ft.

Auxiliary Rooms and Areas

Auxiliary areas defined previously would require considerable addition to the space for the open area.

In an industrial arts woodshop studied in the California bulletin[1] previously referred to, where a separate classroom, finishing room, and day and night class storage are provided, Fig. 52, approximately 2,000 sq. ft. of floor space is used for the auxiliary room while 2,400 sq. ft. is consumed by the open shop area. This would mean that the total shop space would be 3,400 square feet. A craft shop treated in the same bulletin shows approximately 700 sq. ft. used in auxiliary rooms.

Proportions of Floor Areas

The proportions of the floor area of the shop have considerable bearing on effectiveness in teaching. In general, it is a mistake to plan a shop square or nearly square. The best proportion is probably from three to five to two to four. A smaller shop can well be twice as long as it is wide, but when an area is up to 3,600 square feet or more, a little more width may be used to prevent the room from becoming too long. If stockrooms, offices, etc., are located in one end of the room, this reduces the active floor area as far as length is concerned and can be compensated for in determining proportions.

Seating and Demonstration Areas

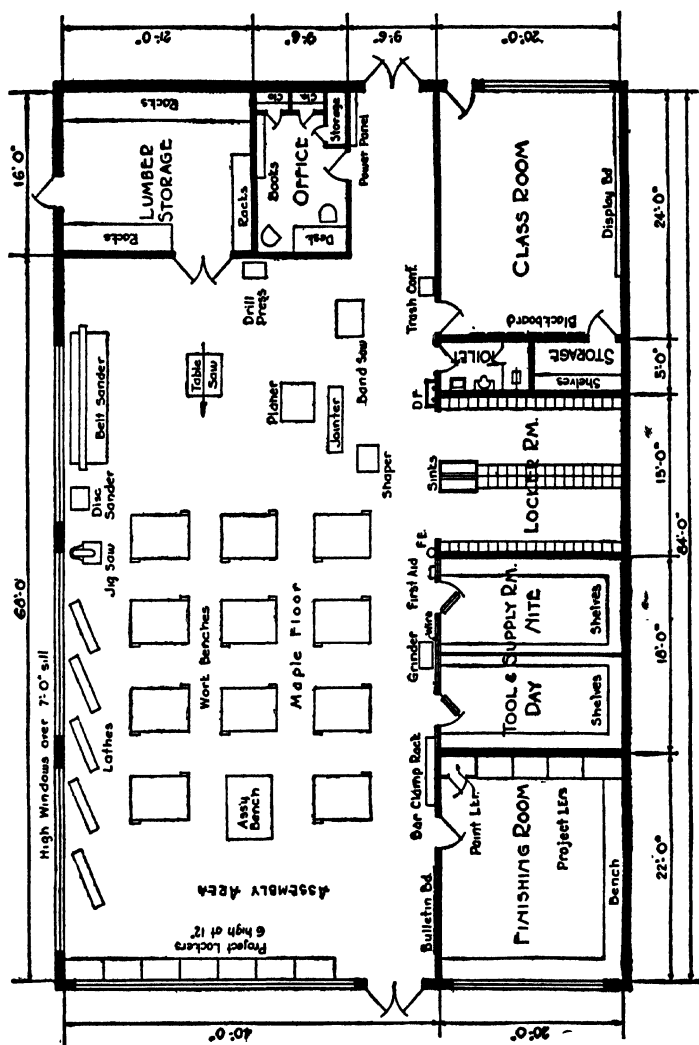
Areas for seating the class and to provide adequate space

CALIFORNIA BULLETIN. STATE DEPARTMENT OF EDUCATION

FIG. 52. An industrial-arts woodshop which provides a seating room and separate storage for day and night classes.

for demonstrations should be kept in mind. In some cases, it is possible to have a combination classroom which is shared by one or more additional shops. In woodwork, electricity, and for most other beginning work in junior high schools, it is desirable to have a place in the shop or a separate room for the students to sit in. Loose chairs may be used so that they can be removed if the area is needed for a large assembly or other purposes.

Tool and Supply Rooms

Whether a separate toolroom is needed will be determined by the type of shop and by established policies. Various procedures for handling tools were discussed in Chapter IV. For shops where heavy tools are used, such as auto and transportation, the toolroom may be justified. In most settings the floor space provided for the toolroom can be used to better advantage for other purposes and tool cabinets can be employed with equal or better satisfaction.

Office or Desk Space

Whether the teacher wishes to use a separate office or have a desk in the shop might be a matter of local preference. The size of an office, particularly for a shop where some supplies and special tools are likely to be taken care of, should not be less than 8 feet square.

A Check List for Shop Planning

The foregoing are only a few of the important points that must be considered when planning shops. In order not to omit important items, a check sheet is highly desirable. The accompanying check list has been found useful. If this or a similar list is used seriously by a person who plans shops or shop buildings, there should be fewer regrets after it is too late to add features or make changes.

CHECK LIST FOR SHOP PLANNING

A listing of items with brief suggestions to keep in mind when planning new shops or remodeling old ones. Detailed suggestions from State bulletins, books and commercial suppliers.

1. Funds available, immediate and future.
2. Objectives for work to be taught, general and specific.
3. Types of subjects to be taught, unit or general shop.
4. Age or grade levels of students, beginning and advanced.
5. Location of shop with reference to other rooms or buildings.
6. Possible future additions, or internal rearrangement.
7. Mezzanine floor and balconies, extra ceiling height.
8. Elevators for materials and finished projects.
9. Provision for seating class, place for demonstration bench.
10. Outside entries, access for deliveries, special drive ways.
11. Contour of land, entering shops at different levels.
12. Building codes, local and state, special school codes.
13. Architectural style prescribed, factory or ornamental.
14. Safety precautions, legal requirements.
15. Per-pupil floor space, activity area and auxiliary.
16. Proportion of floor area, accessibility and supervision.
17. Types of floors, wood, concrete, asphalt tile, linoleum.
18. Location and sizes of doors, double doors for shops.
19. Height of ceiling, 12 ft. to 14 ft.
20. Sizes of windows, legal requirements, location, from floor.
21. Direction of windows, for best daylight.
22. Stockrooms, accessible, easily supervised.
23. Space for planning and drawing.
24. Finishing rooms, special exhaust fan, also heat.
25. Space for storing projects, may use balconies.
26. Library or "browsing table," combine with planning.
27. Provision for evening classes, separate supply and storage.
28. Scientific artificial lighting, 30 to 50 ft. candles.
29. Provision for tools, tool cabinets with doors preferred.
30. Adequate locker space, locker for each student.
31. Space for exhibits, cases open to hallway.
32. Provisions for "work areas," especially in general shop.
33. Blackboard space, convenient to seating area.
34. Bulletin boards, accessible to students.
35. Acoustical treatment, both buildings and machines.
36. Washroom facilities in open view of shop.
37. Adequate heating and ventilation, 68° for shop.
38. Provisions for picture projection, if central room unavailable.
39. Office or desk space, separate office preferred.
40. Electric outlets for machines and service connections.
41. Master switch for machines, conveniently located.
42. Sizes of equipmenr proper foundations.
43. Exhaust and ventilating systems, shavings exhaust.
44. Systems of locks and master keys, saves teacher's time.

45. Running water in shops, hot and cold.
46. Drinking fountains, locate in shop.
47. Fire control, hose and fire extinguishers.
48. Compressed air connections. Get sufficient outlets.
49. Gas outlets and services, ask for enough.
50. Color scheme for interior, consult paint manufacturer.
51. Blinds or shades for windows, venetian blinds preferred.

SURVEYING EQUIPMENT NEEDS

In the approach to the problem of selection of school shop equipment, an evaluation of basic factors and considerations must be made. Among such considerations might well be the following: (1) aims and objectives of the program, (2) type of shop to be served, (3) floor space available, (4) cost of equipment, (5) multiple purpose or combination machines, (6) sources and availability of equipment, (7) purchasing schedule, (8) frequency of use, (9) sizes of tools and machines, (10) portable machines versus stationary machines and (11) methods of specifying equipment. Numbers 1, 3, 4, 8, 9, 10, and 11 will be discussed briefly.

Aims and Objectives of Program

The objectives or purposes underlying the organization of a course have been referred to repeatedly as guiding principles. This approach needs emphasis again when selecting equipment. Is it an exploratory course, a pre-vocational course, or an advance general course for which equipment is needed?

Floor Space Available—Where will You Put It?

This is a question which should be answered before the purchase of any large piece of equipment is made. Determining exact locations can be done through scaled layouts. As suggested previously, pieces of cardboard should be cut out to scale or models made representing each piece of equipment, and then manipulated in various positions for a complete pic-

ture of the best possible layout. *A full-scale layout* on the floor is a still better way.

A few considerations to be kept in mind when locating pieces of stationary equipment in a shop may be of help. The service of equipment is materially reduced by poor placement. In a definite plan for placing equipment:

1. *Consider safety.* This is the prime consideration at all times. Guards, pulleys, and power connections are important factors, in addition to the evaluation of every item, before purchase, with reference to its foolproof qualities and safety features.

2. *Consider the operating space.* Machines without ample space for the operator are dangerous and inefficient. Room for handling the material without strain or crowding is an essential item. This working space should be so arranged that interference from other students or workers is not invited.

3. *Consider light conditions.* Present location of windows will be the main consideration here, unless additional windows or skylights can be installed. Artificial lighting needs also to be considered. See Fig. 56.

4. *Consider the routing of work.* The location of some machines is highly dependent upon this consideration; others are more independent in their function. Where machines must coördinate in a chain of operations upon the material, a logical order of sequence must be considered.

5. *Consider room for later additions.* Many a shop has been ruined for continuous efficiency by the fact that all available space has been taken up by a few machines. When needs develop for additions, a costly scheme for reorganization is necessary.

Cost of Equipment

The amount of money available, both at present and in the future, is an item that must be considered when planning

equipment. Should one spend all that now is at hand on a few "first-class" machines, or attempt to spread it over a larger area, and insist less upon quality? The answer would probably depend partly upon the chance of getting more equipment at a later time. Present action might be different if there is promise of another "allowance" next year.

Combination Machines

Machines designed to carry on a variety of operations are available for school use. Regarding their use, there is a division of opinion. There is opposition to them because: (1) It is usually dangerous for more than one operator to be at the machine; (2) whenever the machine must be converted from one function to another, it causes delay and waiting; (3) these machines are usually not as sturdy and foolproof as the one-purpose machines; and (4) in shop classes there are enough students to justify separate machines. Arguments for their use are that: (1) It is not necessary to allow more than one student to carry on work at the machine at one time; (2) it would not be possible to buy machines for all types of operations that could be provided for through the combination set-up; and (3) some delay in the use of machines is not so serious with students, since other work can be assigned while they wait. At the worst, the work would still be done sooner than if carried out by hand.

Schedule for Purchasing

While no large number of teachers would probably agree upon the order of necessity in the purchase of tools and machines for any shop, there is evidence for the belief that in some cases no serious thought has been given to the problem at all, and that the shop equipment has simply "grown."

Serious consideration should be given to a plan for buying equipment for immediate needs, and for adding future pieces,

SAN DIEGO CITY SCHOOLS

FIG. 53. A modern graphic arts shop is a good example of a limited general shop.

SANTA CLARA, CALIFORNIA, COUNTY SCHOOLS

FIG. 54. A mobile shop solves the problem of expense in connection with tools and equipment for each small rural school.

MODEL MADE IN SHOP-PLANNING CLASS AT SANTA BARBARA COLLEGE, UNIVERSITY OF CALIFORNIA

FIG. 55. Model layouts of proposed school shops will assist lay members of school boards and community groups to visualize projected plans.

LOS ANGELES CITY SCHOOLS

Fig. 56. Good lighting—both natural and artificial—will prevent eye strain and facilitate sustained interest in the work.

in order that correct selections may be made, and that the floor space may be so used as to allow for the total scheme.

Frequency of Use

How many hours per day or week or month will the equipment be used? The answer to this question should enter into the final decision regarding the purchase. Costly equipment standing idle is overhead expense without earning. There are conditions under which highly specialized tools and machines may be justifiable because of occasional use, but the factor of use must not be overlooked.

Portable Versus Stationary Machines

The question of using small, portable machines for schoolwork is not easily settled. Varied conditions deserve individual study and consideration. In many cases portable machines and light, stationary equipment do adequately all the work that larger devices would be called upon to do. The difference in speed is probably not an important item for schoolwork of the average type.

Methods of Specifying Equipment

Every teacher should be familiar with standard procedures in making out specifications for equipment. Such specifications are often necessary in order to comply with legal requirements in asking for bids from various firms and jobbers. But even more important is the use of specifications for the purpose of obtaining equipment of the type or quality desired. In order that inferior substitutions may not be made, it is essential to write out all important requirements of a machine or other piece of equipment. Among points that must be covered are size, weight, horsepower of motors, sizes of tables, types of bearings, belts and pulleys, and the complete list of all accessories expected to be furnished. The purchasing agent

for the school will be helpful in indicating the type of specifications expected by his office.

Further Suggestions

Teachers with limited experience, and sometimes others, report difficulties in receiving proper attention to their needs from administrators. Lack of interest on the part of the administration may sometimes be genuine and beyond alteration. But in many cases where teachers are complaining, the root of the difficulty lies with themselves. They have failed to analyze their own problem, and to organize it into a definite form for presentation. Hence the following suggestions:

1. *Keep the administration acquainted with progress.* If the administrative office hears of the teacher's activities at no other time than when money is to be spent, there may be a poor chance for getting what is wanted.

2. *Have definite reasons for expansion or new organizations already in mind and be ready to state them.* Administrators have an uncanny way of asking questions. If the teacher appears uncertain and wavering in his replies, the chances for favorable action are diminished.

3. *Show how the plan in question will increase facilities for better teaching.* Personal favors, or stressing of inconveniences to the teacher, are poor approaches to the problem. Administrators hear too much self-pity; it becomes commonplace. But they must show interest in better education for children and better facilities for giving it.

4. *Know what you want.* Talking in generalities, without a definite plan, leads nowhere, and simply wears out the proposed idea. Administrators should be approached with definite, well-thought-out propositions. Have a list of the desired equipment and its proposed uses worked out before asking for it. Incidentally, keep in mind earlier suggestions

regarding the use of scale models of shops when presenting plans to administrators.

5. *Know the exact cost.* One of the first questions asked by the administrator is, "What will it cost?" A definite answer to that question goes far toward securing results. If there is not a ready answer, the issue may be postponed and left indefinite. Exact quotations from reliable firms are most convincing, but estimates from catalogs and price lists may serve. Such estimates should, however, be reasonably correct.

Buying Small Tools

The purchase of small tools does not often receive sufficient attention. As a result, the equipment presents a mixture of haphazard tools which do not stand up under the treatment received from beginners, and money is wasted through spasmodic buying in small orders from scattered firms.

Small tools should be specified with the same care as machines and larger pieces of equipment. In general, it is not sufficient simply to name a make of tool wanted. It is better to state sizes, lengths, kinds of handles, etc. The more complete the specification, the less is the likelihood that poor substitutions be made. Even when a specific make of tools is being ordered, it happens too often that not enough data has been given for the vendor to fill the order. After the shipment is filled, as specified, it may, upon arriving, give surprising proofs of either the carelessness or carefulness of the buyer in making out the requisition.

PROBLEMS AND QUESTIONS

1. Make a plan of the type of shop that you would recommend as the only one in a high school of 400 total enrollment.
2. What reasons may be given for preferring the general metal shop to a series of unit shops in a large junior high school?
3. Have changes in industrial and social conditions brought

about new forms of school-shop activities in the past ten years? If so, what?

4. What separate unit shops and what general shops would you recommend for a junior high school of 1,600 pupils?

5. What do you think of the idea of having a separate industrial-arts room for elementary schools?

6. Explain why the planning of a new shop should be the result of rather than the cause of new courses in the school.

7. What are the means by which one may learn what equipment exists in other schools?

8. Make out a sheet showing points for inquiry in connection with a visit to study school equipment for the purpose of getting basic information for your own situation.

9. If a complete course of study were already made, just how would you use it when making up the list of equipment?

10. What are some of the means of making the administrator acquainted with the work of the shops?

11. Name some machines which you think should be in school shops even though they are seldom used.

12. Make a list of firms manufacturing: (1) machine-shop power tools, (2) woodworking machines, (3) printing equipment.

13. Work up a complete list of tools and equipment for a ten-weeks' course in one of the common junior-high-school shop subjects, and show the cost.

14. To what extent, if any, is a knowledge of the industries of the community valuable in buying equipment, after the course of study has been made?

15. By what means would you stimulate interest in extracurricular activities?

16. What would you estimate to be the cost per square foot of floor space of a frame shop building? A concrete building?

17. What additions would you make to the "check list" presented in this chapter?

18. What would you consider to be reasonable expense for new tools and equipment for: (1) a junior-high-school print shop, (2) a senior-high-school woodworking shop?

19. Make up complete specifications for two woodworking machines or for two machines for machine shop.

20. Write a requisition for twenty-five small tools for any industrial-arts shop. Be sure to include all necessary data.

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Chapter XV

EXTRACURRICULAR RESPONSIBILITIES

A Variety of Duties

A teacher who considers that all of his duties are to be performed in the shop or classroom is falling short of giving maximum service to the school or community in which he works. He who expects to render maximum service will seek opportunities to do more than to teach so many periods each day. In fact, practically all modern schools demand of their teachers some type of service outside of their regular teaching program. And while it may be true that the majority of instructors carry a heavy load in connection with their regular teaching, it is also true that anyone who expects to be thought of as a valuable member of a teaching staff must of necessity give thought to making contributions aside from the regular assignments. To be a member of the working force in an educational institution involves a greater challenge than to be simply a shop teacher.

The Home Room

In the modern school a large number of instructors are assigned to sponsorships of classes, or counselors of certain groups of students. In most cases, such groups fall under the so-called "home-room" organization. The home room may be a place of compulsion, disciplinary struggles, and toleration on the part of students; or it may be a cheerful place, where the instructor lives with the youth as their big brother and counselor. Too often the teacher of shopwork feels that he is imposed upon in having to render such service, and would rather be in his shop. In such an attitude, however, there is failure to evaluate opportunities for special service, or to see

the larger aspect of school life. The aim should be not only to teach shopwork, important as that may be, but also to teach students to appreciate qualities that go toward success and happiness in life. Such qualities can, of course, be taught in shopwork, but also outside of it.

From the standpoint of physical organization, a home room consists of a group of students of approximately the number found in a usual class, assigned to a teacher, for regular meetings, daily or at less frequent intervals. The period for the meeting is usually shorter than the regular class hour. In the meeting, some activities are usually prescribed by the administration. Among these are announcements to be made, explanations regarding school programs, fostering special school activities, etc. A portion of the time, depending on the total time available, remains to be used as planned by the home-room teacher, or counselor. It is the planning of this part of the program that will make either a success or a failure of the home room. Not many teachers are making of it an outstanding success. A variety of statements, purposes, and activities are available to teachers. The following purposes are presented by McKown: (1) to develop desirable pupil-teacher relationships, (2) to guide the pupil, (3) to develop desirable ideals and habits, and (4) to expedite the handling of administrative routine educatively.[1] By analyzing each of the areas of activity suggested under this listing alone, the interested teacher will find a wealth of topics for discussion and presentation in the home room. Local conditions in a particular school or community will serve as a guide to material of immediate interest and value to the members of the home room.

To instructors of industrial arts the opportunity to mingle with students outside of the shop should be especially wel-

[1] McKown, Harry C., *Home Room Guidance*, New York, McGraw-Hill Book Company, 1934, Chap. II.

come, for by dealing with materials and mechanical processes constantly one stands in danger of becoming narrow, cold, and perhaps unsympathetic.

Student Morale

There is a broad, general, undefined responsibility with reference to the welfare of all students which the shop instructor must accept equally with other instructors. These duties demand that the instructor show an interest in the students at all times whether in or out of classrooms or hallways, and that he take an interest in assisting students to follow out the rules and regulations of the school. At this point the instructor must consider himself a part of the disciplinary force of the entire school, and be willing to stand the unpleasantness that sometimes may come in connection with law enforcement.

No instructor, whether in shopwork or in other subjects, has the right to shun the responsibility for holding up the morale among the students, leaving it to others to do the share that should come to him. On the other hand, the suggestion may be given, particularly to inexperienced persons, that it is not profitable to attempt to reform a student body or a school singlehanded as an instructor. "When in Rome, do as the Romans do," may be valuable advice. When coming into a new school, it is well first to learn just what standards are accepted by the administration, and then set to work to uphold those standards. Whether such standards are lower or higher than those of the individual instructor, it will be well to accept them, and save possible future embarrassment; or, if not acceptable, to assert influence in proper quarters for necessary changes.

Student Clubs

The special student clubs in which a teacher may interest himself are of two kinds: (1) those organized within regular

school hours, which form a part of the student program, and (2) those falling outside of the regular school day. The former are probably the more frequent. In many junior and senior high schools it has become a common practice to organize the entire school into a series of groups or clubs for a variety of extracurricular activities according to the choice of the students and the ability of teachers to act as sponsors.

Such activities may range all the way from study of Greek and Latin to camera work and clay modeling. These special student activities offer a challenge to every instructor. It may be easier to sit back and let other teachers do the job. But to offer wood turning as a club activity for girls, for two 45-minute periods a week, or chip carving, or any similar activity, may enrich their lives with experiences that would not otherwise be theirs. Girls do wood turning without previous tool instruction! If in doubt, try them, and find out. Among activities falling outside of school hours may be mentioned radio clubs, home-workshop programs, stagecraft work, photography, and various types of play programs.

Counseling Students

Counseling with students forms an important part of a teacher's activities, whether or not the teacher has received a definite appointment for such service. In fact, true teaching has always been partly counseling. Youth needs counseling and likes it, provided it is of the right type. Nagging is not counseling, nor are dictation and forced advice.

To be interested in the individual instead of in the masses, to deal with classes and groups and yet know and appreciate the individual and be a friend and counselor to him, requires more than craftsmanship and mechanics. Without having developed an interest in helping each youth to form wholesome attitudes toward his fellow man, vocation, and employ-

ment, an instructor is not fully prepared as a member of the great profession to which he belongs. Many a student continues to build for himself false ideals and poor social habits because each of his teachers is teaching subject matter instead of boys and girls. What the world expects is not often explained to youth in a setting where the explanation is applicable. Every instructor must have the necessary courage to be personal, friendly, and unbiased in assisting individuals in this regard through private interviews and in other ways.

Displays and Exhibits

"Shall I have an exhibit this year?" is repeatedly the question before shop teachers and supervisors. The answer will vary with different teachers, according to whether they believe the exhibit to be worth while or not, whether they have the necessary interest and initiative to put one on, whether the administration calls for one, and whether they have done work of the kind that will stand exhibition.

Objections to Exhibits

Aside from some of the childish arguments that have been used against exhibits by teachers who in reality do not want to do the extra work necessary, there are some points that can logically be taken into consideration on the negative side of the question in some situations. Among these are the following:

1. Exhibits may have been used year after year in the same way in the same place, until they have lost both novelty and attraction.
2. The articles shown in exhibits are seldom representative of the average accomplishment of work done, but rather of a selected few, and often even the teacher's finishing touches can be recognized upon articles exhibited.
3. The prospect of the exhibit discourages the less talented

worker who is just as honest and industrious as the one who is better adapted for the work.

4. Work held for exhibition is kept beyond the time when boys and girls will have further interest in it, and so the keen pleasure of ownership is destroyed, imperiling possible interest in future work.

5. The fact that the work is to be displayed to the public tends to lead to dishonesty in production, getting help from other students and the teacher with the difficult parts of the work.

6. In many cases the hardest and most difficult work done is not recognized as compared with some of the more showy and superficial type.

7. When students know that their articles are to be exhibited, this fact may influence their choice of work rather than real necessity and personal desire.

8. Students limited financially are at a disadvantage, since they cannot pay for material for a large and expensive article.

9. Some of the articles are often damaged in shipment or transfer or lost entirely, working a great injustice to their owners.

Advantages of Exhibits

On the affirmative side of the question may be offered the following suggestions:

1. If parents and patrons are accustomed to annual exhibits, there would probably be more disappointment than the teacher expects, should he leave them off any one year. Exhibits do not have to be put up in the same way each year.

2. The prospect of the exhibit will stimulate better effort on the part of practically all students, and such stimulation can be kept in the right channels by the capable and interested instructor.

3. New students are attracted through the proper type of

exhibits, largely because they are inspired by the success of other students whom they know.

4. Taxpayers and patrons, and even the superintendent and the principal, have an opportunity to see how the money has been spent and what has been accomplished.

5. Exhibits stimulate the teacher to renewal of effort toward producing high-grade work. A little thought of approbation on the part of the teacher is no disqualifying trait. See Fig. 57.

6. There is value in the thought, on the part of both teacher and student, of spending their energy in such a way that the result will show to best advantage. This ability need not be mingled with dishonesty, and is usually rewarded in practical life.

7. The exhibits involve opportunities for special training and practice in spacing, arrangement, poster making, and lettering, as well as meeting and dealing with the public and explaining the work. See Fig. 58.

Exhibits have, without doubt, been a great factor in the promotion of the school shop and of the industrial-arts idea. They are not yet obsolete, though there may be local conditions that make their value doubtful.

To Be a Faculty Member

To be a member of a teaching staff is a greater charge than to be a teacher of drawing or machine-shop practice. In some respects the severest tests of the instructor's integrity and all-around value come outside of his teaching hours. The following suggestions may be of value at this point.

1. *Be loyal.* Loyalty to supervisor, principal, and superintendent is the greatest of all requirements upon a teacher. Without such loyalty, both felt and expressed, he cannot hope to be worth his keep. One may differ with present policies and practices and still be loyal. But if one cannot sympathize

with the work of the school and those that are responsible for its management, at least if one cannot suffer in silence, the only decent thing to do is to leave for other fields. There may be teachers who feel that they should be the supervisor or department head, and sometimes justly so. But since they are not, if they are made of the right kind of stuff, they will try to be good instructors and not try to undermine the work of others; or get out to some other place where their abilities and viewpoints may be more appreciated.

2. *Be coöperative.* Many teachers are good workers, but not good teamworkers. Coöperation is looked for in any school system, and particularly in shopwork, where the activities touch more directly upon the practical in life. Coöperation with the principal, the coworkers in the department, and with other departments of the school is absolutely necessary for the ultimate success of one's own work as well as of that of the entire school. Lack of coöperation is caused by improper viewpoint. Suspicion of the motives of others, lack of feeling of security in one's own position, limited vision, and guarding one's own dignity are some of the enemies of coöperation. An optimistic attitude, a habit of saying "yes" instead of "yes but," and a belief in the integrity of others, are the friends of it.

3. *Appreciate the work of others.* Lack of appreciation of the values of so-called academic subjects is sometimes shown by special teachers. Such attitude is a display of shortsightedness and lack of understanding. To "knock" the subject matter and teachers in other departments of the school is to show ignorance and lack of vision. No thinking person will attempt to build up his own work through the process of tearing down that of others.

4. *Build cautiously.* Enrollment in a new department may not be built in a day. Use fair and open methods to attract students. They will stay longer after they come.

5. *Do not be jealous.* The other man's job is not what it seems to be. If you got it, you would still wish for someone else's job. The "big" salary that Mr. Brown earns he probably deserves through extra responsibility, longer working hours, or for some other reason.

Teachers' Meetings

Teachers' meetings are likely to be looked upon as an unnecessary evil. Sometimes they deserve to be so considered. Where such meetings are scheduled and carried out as a perfunctory performance, with no definite plan or program, they may not be inviting after the day's work is finished or nearly so. When preceded by purposeful planning of program and procedure, faculty meetings can be made to contribute not only to the efficiency of instruction and administration, but also to the professional improvement of the teachers.

Whether the meetings are of special interest or not, it is the duty of teachers to attend. It is one of the activities for which he draws his pay. The sooner he achieves this attitude of mind, the better it will be for everyone concerned. Many plausible reasons may be given why the shop teacher does not go to these meetings, and every other teacher can probably furnish similar ones. Certain tools or other pieces of equipment may need attention, materials are left in a place or shape where they cannot be allowed to stay overnight, and so on. And there is probably some tendency on the part of administrators to overlook irregularities on account of these special duties. Nevertheless, the efficient teacher plans his work so that he can attend scheduled meetings for which he has received due notification.

Mail Boxes and Bulletin Boards

There is danger also that teachers of shopwork fail to see

notices on bulletin boards, or otherwise miss various announcements. Such failure comes in part from being located out of the beaten path of activities. This means that such instructors need to be doubly alert with reference to announcements and general requirements. It is a deplorable fact in some schools that shopmen have proved disappointing in their attendance to special duties. The teacher with a professional mind will be eager to attend all meetings to which he has been called, and participate in discussions of all activities pertaining to the entire school.

Personal Appearance

The problem of personal appearance and tidiness in dress confronts the teacher of shopwork. It is not desirable, if it were possible, for him to attempt to keep himself spotless when teaching his classes. He should be dressed for actual work, just as he wishes his students to be dressed for work.

Outside of his shop, however, he will wish to appear as any other instructor rather than as a mechanic, and the dignity of his position demands that he do so. This diligence in watching personal appearance tends to subside with time, and if the teacher is not alert to the situation, he may find himself failing to apply the energy needed in this connection. There is no reason for being ashamed to get one's hands into grease and dirt in the shop; neither is there any reason for carrying that dirt too far outside the walls of the shop.

Out-of-School Relationships

An instructor can probably confine his activities to the school and school plant, and still be considered a good teacher. By common agreement he would, however, be a better teacher if he let his activities go beyond that realm. Any community is rich in worth-while opportunities for contributions to the common good outside of the four walls of the school.

Just how much time should be spent in such activities, and what the nature of them should be, will naturally be determined by each individual. The Boy-Scout movement offers opportunities in this connection; and many smaller and larger school systems are making participation in that work a required part of the services when furnishing the contract. Charitable and civic organizations are often in need for teaching service in craftwork, and churches bid for contributions to educational and recreational programs.

No attempt is made here to define duties in connection with these opportunities; it is sufficient merely to say that from the teaching profession society expects and is entitled to leadership which shall extend outside of the schoolroom.

Relationships with Business and Industry

A person who expects to maintain and increase his usefulness as a shop teacher—or as any other type of teacher—will not fail to make and maintain contacts with business and industry. This holds true in regard to both men and methods. To one whose time is largely spent in the schoolroom dealing with immature minds, the opportunities to mingle with men of affairs in business life should be cherished. Organizations of such men in the form of luncheon clubs, lodges, and others, are open for memberships. From these, practical outlooks upon problems may be gained, and the vision of the teacher is widened.

Time should be set aside for regular contacts with industries, and with those who manage and operate those industries. Not of least importance is it to keep in close touch with trade methods in craftsmanship and production, for these methods change from time to time.

Out of the Basement

The antiquated custom of confining "manual training" to

the basement, or to the most unattractive room, has left with many teachers an apologetic attitude toward the subject and its teaching. Recognition has come to the industrial arts as one of the major and most essential subjects in the curriculum. But many teachers still appear to have a "down-in-the-basement" attitude of mind that makes them hesitate to accept what both school administration and the public have come to take for granted, that industrial arts is one of the most valuable aspects of the school program.

PROBLEMS AND QUESTIONS

1. In what ways does a shop teacher have superior opportunities to teach courtesy, coöperation, and other desirable personal qualities in his regular classwork?
2. As an instructor in a high-school shop, what contributions could you make to the programs for faculty meetings?
3. In what respects, if any, are teachers expected to be superior to other persons in personal conduct?
4. To what extent do you believe that a teacher should feel responsible for the morals and manners of his students?
5. Name the type of clubs that you could sponsor in the school, and show the value of such clubs.
6. Make a list of student activities not mentioned in this chapter in which the teacher may be of value to the school and to the administration.
7. Make a list of civic and social organizations that would offer profitable membership for an instructor of shopwork.
8. Make a list of agencies and locations in a community which may be brought into a comprehensive plan of exhibits of school work.
9. By what means would you stimulate interest in extracurricular activities?
10. Assuming that you were to use two hours a week for making contacts with industry and business, make a schedule showing exactly how that time would be spent for one semester.
11. List the names of agencies outside of school which further leisuretime interests of youth.

12. Make a list of topics that may properly be discussed in the home room.

13. Make out a plan for complete home-room activities for one semester.

14. What should a teacher know about the entire school program in order to be most useful in connection with extracurricular activities?

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Chapter XVI

PUBLICITY AND PUBLIC RELATIONS

The Public and the Schools

Only recently have school people come to appreciate the necessity for keeping taxpayers and parents informed regarding programs and purposes of public schools. Both teachers and administrators are inclined to become involved in the serious business of carrying out the educational program to the point of forgetting that support and good will are essentials to the success of this program. If public understanding is needed in regard to the commonly known subjects of the school, it is even more important that such understanding be established for the newer and less-known subjects, of which industrial arts is one.

Should Schools Be Publicized?

Four reasons may be given why there is lack of publicity in connection with the shopwork program:

1. *Teachers consider advertising unprofessional.* There is a feeling that the service is cheapened if means for spreading the news of the work are used. This attitude is shared by members of other professions, sometimes, no doubt, to the disadvantage of persons who should have certain information.

2. *The work should speak for itself.* Many teachers take the position that their work is of such importance that students should rush forward to enroll. In this they fail to realize that however important it is, students must know about it before they can seek membership in the classes.

3. *Some have not thought of it.* A third class of teachers have not realized the possibility of doing something outside

of receiving those who come. Students are sent from the enrollment office, and the instructor considers that he can do nothing if the attendance is not satisfactory except to carry ill-feeling against the person who has charge of the student programs.

4. *Some need no more students.* In many schools the shop teachers are overcrowded with students, and have little incentive to undertake publicity schemes that might tend to make their work even more popular.

If the instructor believes that the shopwork program functions as an important part in the education of a large number of students, he will be eager for those who may profit from it to know that it exists.

Local Newspapers

Schools can usually depend upon the support of local newspapers if that support is intelligently solicited. In spite of such discouraging factors as misprints, exaggerated statements, "flashy" reports, and the like, which have to be dealt with, the newspaper has become an important institution of society, and may be of great assistance in developing any public enterprise. The public schools, being owned by the community, must be kept before the eyes of those who pay the bills if intelligent support is to be expected. Too little publicity for the program of the school has often led to misunderstanding and lack of confidence.

In connection with newspaper items, as well as other forms of publicity, care must be taken by the individual teacher not to absorb the prerogatives of someone else who may consider it his privilege and advantage to handle this phase of the work. Principals may sometimes be jealous of such privileges, and, if so, it is the duty of instructors to coöperate in such practice as may be desired. The personal factor should, at all times, be left out of consideration.

Two types of newspaper service may be considered: (1) contributed news items, and (2) paid advertising. The second is rarely necessary, but may be used in connection with special adult programs and vocational classes, or in order to advertise publicity schemes such as open nights, special shows, or exhibits.

Items of news may appear at fairly regular intervals telling of new courses, special projects for school and community, special contests, and other activities. A profitable feature has been the writing of a series of short articles telling of the program of the school shops, its aims, and services. Such a scheme should first be submitted to the principal for his approval, and it is well to have the material read by him, or someone else who has in mind the broader viewpoints of the entire school, in order that no statement may be misconstrued or considered as a reflection upon any other phase of the school program. The "copy" for such articles should not be altered by the editor without permission of the writer, if the latter's name is to appear with the contributions.

The School Paper

Too little attention is often given to the school paper as a means for spreading the news of the industrial-education program. The shops furnish interesting themes for youthful reporters, but the difficulty is that those reporters do not normally turn in that direction for material. Consequently, it is the task of the instructor to stimulate the needed interest.

The school paper reaches the sources from which future enrollment will come, namely, the students and the homes. To be too busy to pay attention to this medium of publicity may be to curtail possibilities of future success.

Special Publications

Bulletins issued by the department constitute a valuable

type of publicity material. These can be mimeographed or printed, depending upon conditions. They have been used largely in connection with vocational and adult-education programs, but have their value also in spreading news of activities in nonvocational work. There are many ways in which a school print shop can thus be handling practical jobs, and at the same time serve the interests of the department or the school.

Contests and Sponsored Projects

Contests of various types have publicity value. Newspapers in many places have taken great interest in promoting these. In large and small cities alike, a motorboat race or regatta, as a climax to a model-boat-making contest, will receive more attention of the citizenship than the work of all the rest of the program.

A bird-house-building contest sponsored on Saturdays for boys of all ages will win the good will of mothers, and mothers' good will should not be disregarded in connection with advertising the school program. Kite and airplane flying contests have come to be annual events in many communities, sponsored often by such outside organizations as Boy Scouts, Y.M.C.A., and others.

Exhibits as a Publicity Feature

Exhibits have long been used as a sure means of stimulating interest in shop activities. If the exhibit is an honest one, and so planned as not to disorganize regular activities, it still remains in the front rank as a publicity feature. Advantages and disadvantages of exhibits have been discussed in Chapter XVI. Permanent exhibits should be used in offices and hallways of schools, while periodical displays can be set up in prominent windows of banks, stores and other locations in the down-town section. See Fig. 59. An annual exhibit at

the school may be varied from year to year, or may be omitted entirely, in favor of the types of display just mentioned and other special features.

The Open House

In many school systems the "open house" has become an annual affair. On this occasion the entire school is usually run in the evening as in daytime, in order to give the parents and patrons an opportunity to see its varied activities. Needless to say, the shop program may be a large part of the attraction because of the very nature of the work. Exhibits may be featured, as may also special construction devices and machines.

A so-called "electric show" proved to be one of the most profitable publicity features in the author's experience. On this occasion all dealers in electrical appliances in the community were invited to "buy" exhibit space at a nominal fee in the school gymnasium. The response was extremely generous. Special stunts ranging all the way from spanking machines to toy electric trains were arranged by the electrical department, which also kept open house for the visitors. A display was made of electrical "projects" completed and in the making. In the main auditorium a special picture was shown at a small admission charge. Since all the merchants who offered exhibits participated in the publicity event, a large attendance was assured. The money earned was used for special radio equipment, and the purpose of the performance from this angle was announced beforehand.

Signs and Signboards

Vocational schools and special schools have used large signboards to advantage. Such signs call attention to the fact that facilities for training are offered by the school system, and stimulate individuals to take advantage of them. An electrical

class or department will find the construction of signs to furnish a practical problem, resulting in both publicity for the school and application of electrical principles.

For the Superintendent and Principal

In many schools the superintendent, or even the principal, knows very little of the work of the industrial-education department. To be sure, the shop classes are thought of in connection with bleachers on the football field, or furniture for the cafeteria, or apparatus for the playground. But very little is known of what is accomplished educationally. Sometimes the best publicity that can be done is to scheme out some way through which to attract the attention of the principal and superintendent, not to omit the academic teachers and the board of education. Let something happen so that newspapers and outsiders begin to give attention, and recognition at home is likely to follow. An annual or semiannual report, as discussed elsewhere, is a good means of publicity.

A Plan for Publicity

The teacher is justified in planning in a limited way a publicity program for his department and its values just as commercial firms make plans for theirs. Many instructors who are doing splendid work in their shops receive no recognition because no one knows of their activities. A sane program for the purpose of letting outside people know the objectives, procedures, and accomplishments is legitimate, and while cheap and unsubstantial means and methods must of necessity be ruled out, there is little danger that the public will be reminded too often of what the schools are doing in giving an education to its youth.

Personal Contacts

Another avenue and one which is most effective in building

good will and understanding toward the school program is through personal contacts with community leaders and taxpayers generally. The teacher of industrial arts, because of his interests and background, probably has an advantage in dealing with men from business and industry. A certain amount of time should be set aside each week for planned contacts with men of this type. This can be through participation in community projects or in clubwork, through sports and recreation, and in other ways. If more of the taxpayers know more teachers personally, there will be less likelihood of lack of appreciation of the work of the schools or any phase of the school program.

PROBLEMS AND QUESTIONS

1. Make a list of possible evening activities through which a teacher might further the growth of his shopwork program.
2. Have you known teachers to overdo the matter of advertising? If so, in what respects?
3. Name a number of ways through which the principal, superintendent, and board of education may learn about the work done in the shops.
4. What publicity value is there for shopwork if the teacher becomes connected with the Boy Scout activities of a community?
5. A young teacher stated that the first thing that he would do when coming into a small community would be to go to a newspaper office and get "written up." What do you think of the idea?
6. Make a list of avenues for publicity not mentioned in this chapter.
7. Would Saturday-morning "open house" in the shop for all boys who wish to make things be a good publicity scheme?
8. Make out a complete schedule for the publicity of a shop program in a small community where not more than two teachers are engaged in this special work.
9. In what way may industrial motion-picture films be used to promote the industrial-education program?

10. If you were organizing a vocational class in auto mechanics or electrical work, what would you do to build up an enrollment?

11. In what ways may industrial-arts work be publicized through the school paper?

12. List a number of schemes by which the general student body in a high school may be informed about the industrial arts.

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Chapter XVII

THE TEACHER AND HIS PROFESSION

How One Learns to Teach

It has been said that there are four ways in which people learn to teach:

1. *Anticipation of teaching.* By this is meant that in his imaginative mind the person who possesses aptitude for teaching will go through the actual setting of the contact with his class. And in this imaginative procedure he will foresee and determine upon problems that will be encountered, and action to be taken in solving these problems. To be sure, such ability to anticipate and "live" through the work of days and hours which are yet in the future is a prerequisite to highly successful teaching in any subject, but especially so in those subjects in which manipulative work predominates.

2. *Observation of teaching.* This is another valuable avenue of success as an instructor. Such observation is not necessarily confined to the type that is controlled and required by teacher-training institutions and boards of education. It is probably true that teaching methods of our own teachers all along the line of our educational career have done a great deal toward shaping the actions and responses which we as teachers now put into effect. Much of this background is, no doubt, used unconsciously or subconsciously, but is, nevertheless, a powerful factor in any instructor's work. The teachers whom we have most admired have, unquestionably, impressed us most; but it might be well to realize that even those might have had their imperfections as instructors.

3. *Directed teaching, or cadet teaching.* Here reference is made to teaching carried out under direct supervision in a teacher-education institution. If conditions are what they

should be, this type of preparation should stand out as a most desirable and basic medium through which the prospective teacher will learn to teach. For in this phase of a teacher's preparation, there are more possibilities for definite supervision than in any other type.

4. *By teaching on the job.* It will be agreed that actual performance of work will, under reasonably favorable conditions, lead toward perfection. This is not always true, however, because it is quite possible for one who learns solely through his own efforts to persist in wrong practices and inefficient and obsolete methods, while other people have discovered more efficient ones that are unknown to him. Learning to teach on the job, particularly in the first stages of a teaching career, is effective largely in proportion to the amount of criticism and suggestions the teacher receives either from outside supervision or by self-examination and comparison of his work with standard practices.

Cardinal Qualifications for Teaching Shopwork

Three outstanding qualifications for successful teaching in shopwork have been generally agreed upon and often expressed. They will bear repetition and emphasis:

1. *Ability as a craftsman.* This has to do with the necessary mechanical skill required on the part of the teacher. Lacking in mechanical skill, the instructor cannot hope to accomplish maximum results. As has been pointed out elsewhere, it is the duty of the instructor to qualify himself through sufficient practice and contact with trade practice, if such contact is lacking, in order that he may at all times set the proper example in craftsmanship.

2. *Ability to teach.* A fine craftsman, however, is not necessarily a good teacher. There is great difference between being a producer and being able to analyze and present teaching material to learners. As a matter of fact, habitual per-

formance in industry is likely to be a drawback rather than a help when attempting to teach persons without experience, for the skilled worker is likely to overlook the learning difficulties encountered by the learner. Successful teaching is dependent upon knowledge of fundamental educational principles and methods. Such knowledge comes from professional work in teacher-training institutions and from continued study and research. Requirements in this field of work are now specified by state departments of education for certification to teach in public schools. Unfortunately, such requirements are not uniformly stipulated for teaching in institutions of higher learning, not even for colleges preparing the teachers to be so certified. To have an appreciation of the mental processes by which learning takes place is just as important as knowledge or skill in the field of subject matter, and must be so considered by everyone who expects to become a good teacher.

3. *Scholastic and cultural background.* Knowledge of a single subject, and knowledge of how to teach that subject, would still not enable a teacher to be of maximum value in the profession and on the job. A rather intimate knowledge of other subjects of the curriculum, of social and economic aspects of education, of backgrounds that broaden one's vision and create sympathy for other work and other instructors, is a necessity as a third qualification of a well-educated teacher.

In this respect, the special-subjects teacher should be on full equality with those teaching other subjects. The fact that some of the earlier shop teachers were considered "mere mechanics" and "trouble shooters" can often be traced back to the fact that in reality they were not much more than what those terms imply.

Advancing Professionally

In the field of manual and industrial arts, the teacher's task

has grown with amazing rapidity. In many cases the job has outgrown the teacher. At one time, woodwork and drawing were considered sufficient for the smaller schools. They are no longer so considered—except by some teachers who have not learned what progress has taken place.

The teacher who began teaching some decades ago, and who does his work this year as last year and the year before, has outgrown his usefulness. He has failed to catch the spirit of progress through the various means which are within his reach. The demands upon youth are changing, and so are his interests and ambitions. Looking back upon past accomplishments, instead of forward to new possibilities, means to grow stale in the work and commonplace in its presentation. Looking forward will result in research, anticipation, further preparation, and better service.

There is a tendency on the part of some shop teachers, however, to rebel against upgrading suggestions and requirements that involve general educational training rather than specialized skills.

Teachers in the service today are confronted upon every hand with the question of professional advancement. The pressure brought to bear is variously interpreted. Some are inclined to feel that the scheme is the result of the whims of the superintendent, others that it is to increase the average scholarship rating for the teachers in order to gain in reputation. Not all can see that they will be better teachers after having completed further study, and the question in their mind is, "What is it all about?"

Advantages of Self-Improvement

Some of the reasons why teachers of shopwork can profitably and cheerfully participate in a general upgrading program for teachers have already been suggested. In addition, the following points may be stated:

1. *Teachers are rated largely upon the basis of scholastic attainment.* Whether this should be so or not may be another question. With few exceptions, it is so; and the teacher can do no better than to adjust himself to the condition.

2. *New teachers are more fully prepared.* Qualifications governing the entrance into the profession are gradually being raised. Persons already in the field with less than those qualifications will find more serious competition, and usually wish to consider the problem of attaining an equal rating in point of credits.

3. *The shop teacher should be at par with other teachers.* This includes educational refinement, use of language, appreciation of general values of educational procedure, understanding of the entire curriculum, and other essential qualifications. Such qualities come from the proper attitude in regard to the general aspects of the program, and from interest in and study of the varied types of subjects and subject matter pertaining to it.

4. *Personal contacts with instructors of other subjects are a valuable asset.* To mingle only with one's own type is to narrow the vision to too small a scope. Study and discussion of basic problems, and even special problems in other fields than one's own, will broaden the teacher's vision and make him more useful in the service.

The Teacher's Library

No instructor can expect to measure up to the greatest possibility of success without gradually acquiring a personal library. Just how extensive this can be will depend somewhat upon the type of work engaged in, and the peculiar interests of the individual. The amount of material will probably be governed by the length of time the teacher has been in service. The material that can be gathered for help in teaching may be classified into four kinds as follows:

1. *Professional magazines.* The value of periodicals as a help in teaching is often underestimated. In these are presented the latest thoughts and the most mature judgments with regard to principles and practices within the field. Their one big mission is to keep teachers alive on the job. Professional magazines within the special field considered here are now available at a cost that is low compared with values received. To be able to find such magazines in the school library or public library is not enough. The effort and inconvenience connected with obtaining them from such sources too often prohibits their full use in the work of the teacher.

2. *Trade journals.* To keep abreast with the work of the world is an everpresent duty of the shop instructor. Unless he guards himself he may find—or others may find—that he is thinking in the past instead of the present. Methods used in the trade ten years ago, when he served as a workman, may not be used now. One way to keep up with modern industry is through the journals of the trade. Some phases of mechanical work represented in school change more rapidly than others, but all are constantly changing. Professional journals will keep the teacher informed in methods and procedure in schools; trade journals will give him a review of industry. Both are essential in the life of a modern teacher of shopwork.

3. *Popular magazines.* Another class of magazines, rich in values and suggestions for the shop instructor, is the type covering popular phases of science and craftsmanship. In these are often to be found kinks for the shop, articles of interest and educational value to boys and adults, and material for topics of related and occupational information.

4. *Professional books.* Collecting and reading books pertaining to one's professional work may not be a guarantee of efficiency in teaching. But it is one indication of such efficiency. If in doubt, make a survey of the men who have

FIG. 57. Many good ideas come from school exhibits at conventions and professional conferences. (California Industrial Education Association Southern Section Meeting.)

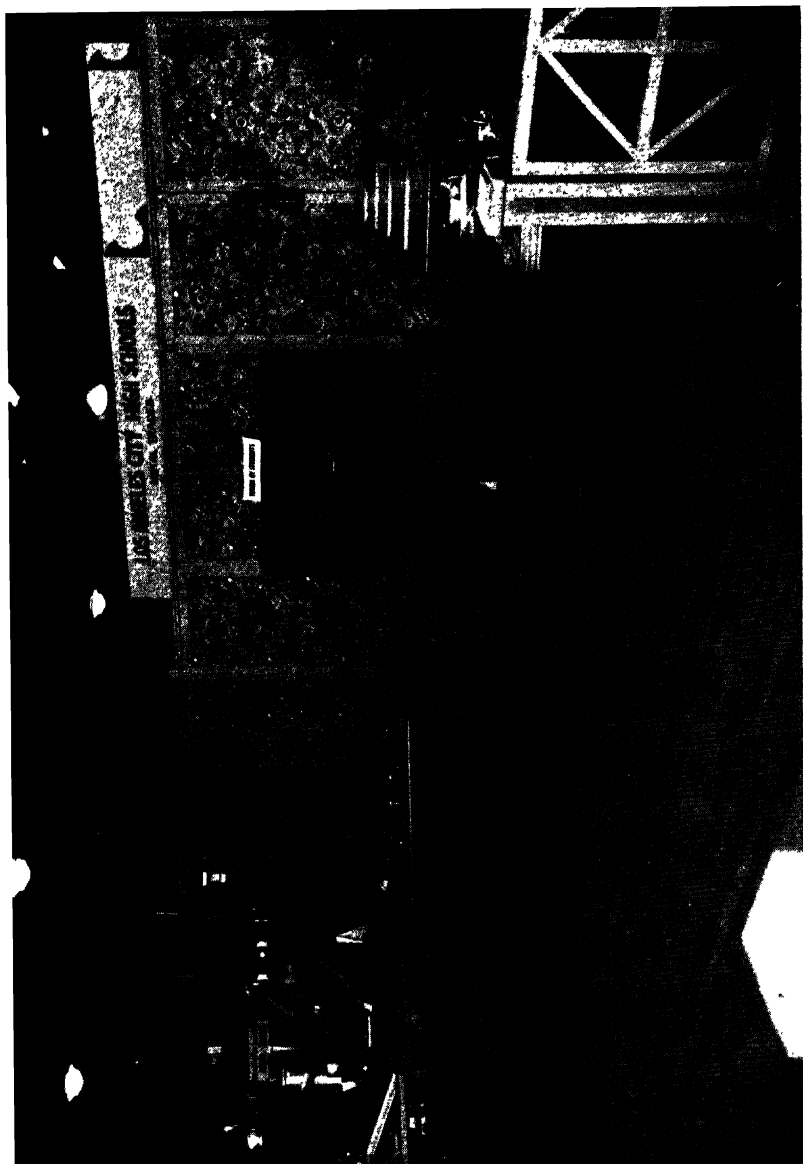



FIG. 58. Community exhibits of school projects constitute an effective method of bringing the school to the taxpayer.

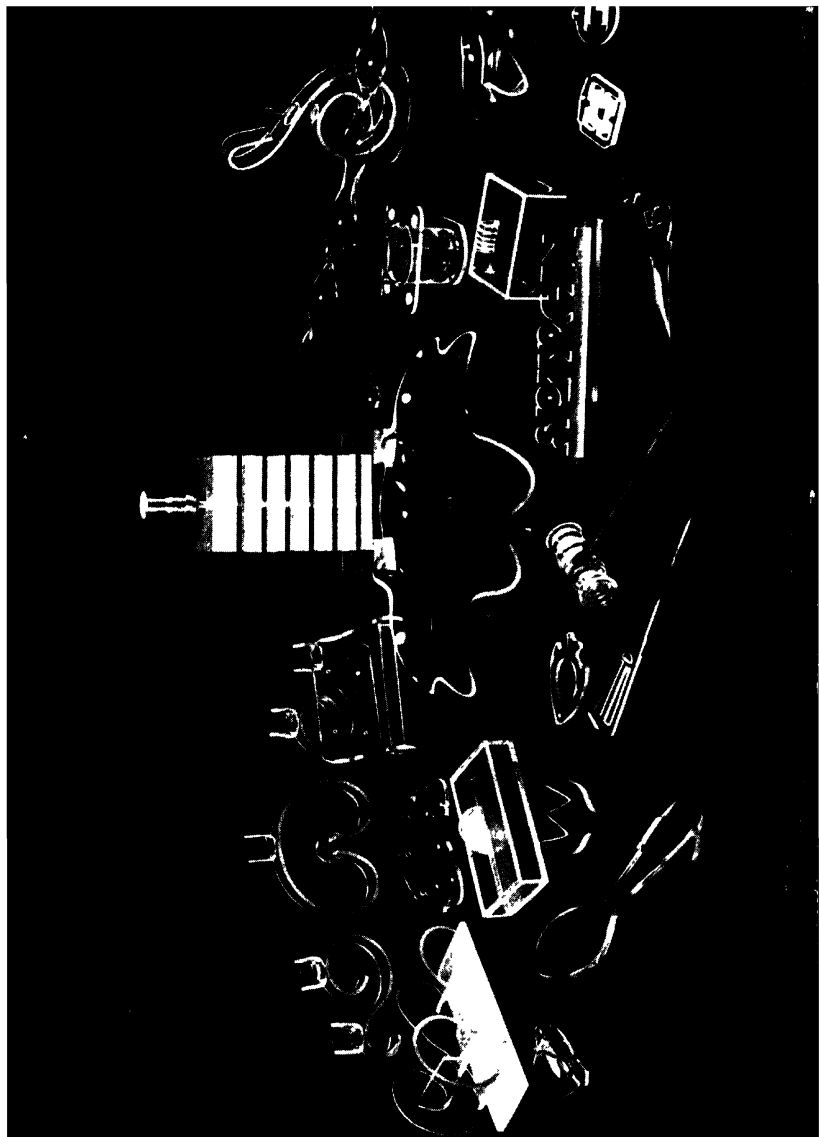
Fig. 59. Exhibits in which students are engaged in operation of equipment have an added appeal to visitors.

LOS ANGELES CITY SCHOOLS

FIG. 60. The willingness of teachers to show new ideas and projects means a distinct contribution to improvement of the industrial arts program.

progressed and assumed leadership. Not that all parts of all books are directly useful, but they build for the reader a background, a foundation upon which to base his own action, and usually his action is more acceptable because of that which he has read. Without becoming acquainted with principles and teaching methods as organized and presented by others, the instructor cannot expect to reach maximum efficiency in his own work. Teachers are usually eager to obtain books of projects and things to be made. They should be similarly eager to discover the best possible methods of handling their students, and of transmitting more lasting values than a few tool operations and a little skill.

Conventions and Institutes

Some teachers faithfully attend conventions and institutes while others stay at home. Both receive the same salary. What is one gaining that the other is not? Those who go, if their attendance is voluntary, have answered this question in their own minds. But those who stay home, or who wish that they could stay home, have difficulty in finding sufficient values to justify them in spending time and limited resources in order to attend.

Arguments against institutes are numerous. "The program is always arranged for the other fellow"—for the academic teachers. "The convention is run by high-brows." "The speeches cover material of no interest or concern to the shop teacher." "The conventions are poorly managed; meetings do not begin or end on time." "The same old stuff is repeated over and over." "Certain individuals try to control the whole performance." "Some sections of the state or county are receiving too much attention." "There is too much generalizing, and not enough coming down to practical problems." "*They* do not know as much as *we* do about it," and so on—a consid-

erable part of which is true, but not yet convincing that such meetings are not worth attending.

Benefits from Conventions

Let us show the other side of the question, and offer a few advantages of attendance upon institutes and other professional meetings:

1. *Become acquainted with leaders.* Leaders in the field may be found at conventions. To meet them personally, to become inspired by their personality, to learn something of the secret of their success, should be worth while to every person in the ranks.

2. *Learn new methods.* Receiving a first-hand knowledge of methods and organizations in schools and school systems where the most effective work is done is another advantage which changes from year to year. Programs of merit are reviewed by persons who have done more thinking and planning than the men in the ranks. Although not much of such material can be taken home bodily and applied, the ideas set forth will broaden those who receive them, and many of them are usable in other forms.

3. *General inspiration.* The general inspiration that comes from hearing speakers of power and vision, and the renewed confidence in the worth-whileness of the work, are matters worthy of consideration. "Without vision the people perish," is no more true anywhere than in the teaching profession. And how can there be vision for the individual who never shares the viewpoints of others working in the same field or allied fields? The best of men will become discouraged when struggling alone. A convention is a source of inspiration without which no progressive teacher should plan his year's work.

4. *While one gives he gets.* To have a part in working out unsolved problems, of which there are many in the field of industrial arts, to assist in clarifying aims and objectives

and in formulating policies for this increasingly important phase of education, should be the ambition of every true teacher. Some will contribute little, others much. But while contributing, if only through interest and his presence, the teacher builds for himself a greater foundation for service that will reap rewards in due time. Assistance in building for stability and permanence in the program will repay in opportunities to do better service as a teacher.

What Experience Is Most Desirable?

In the early part of this chapter the outstanding qualifications of shop teachers were classified under two heads. An examination in regard to each of these requirements should result in a reasonable decision with reference to the use of the summer time, barring, of course, unusual financial or physical difficulties. If the teacher is weak in mechanical skill, let him go into the trade; if he is too much of a tradesman, and too little of a teacher, let him seek the education needed in a suitable college; if he lacks backgrounds and appreciation, let him study literature, economics, sociology, or simply find an opportunity to mingle with broadly educated men.

Some teachers can profitably be reminded of the need of getting degrees and ratings; others, and not a small number, should probably be encouraged to forget them for a while. Professional advancement there must of necessity be, but of what it should consist is another question. There is danger that the tradesman never becomes educated into the spirit of efficient teaching, but also that the teacher becomes educated away from tools, labor, production. Both sides are real. The "swivel-chair" vocational teacher, who has substituted telling for doing, and surveys and card files for demonstration and production, is just as inefficient as the industrial-arts teacher who simply acts as a foreman for the group in turning out production work.

Looking for the New

As previously brought out, one test of a teacher's efficiency is whether his mind is open to new ideas and suggestions. The spirit of experimentation keeps the shop instructor alive. Too many are looking back instead of forward, and doing their work this year as they did last year. The work loses its freshness to the instructor and the pupils. Meanwhile, there are teachers all about who discover and organize new methods, new products, new approaches. Looking for the new in magazines, books, industry, and in one's own imagination is a professional duty, and the joy of members of the teaching profession. See Fig. 60.

Contributing Ideas

Many teachers who are doing outstanding and unique work go to their graves with their "trade secrets." It should be an accepted duty to contribute to others those problems and procedures which have originality and which have been found to be of special value. Such contributions can be made in the form of magazine articles, talks at teacher's meetings, or in other ways.

PROBLEMS AND QUESTIONS

1. What other means can you think of through which one may learn to teach except through the four mentioned in this chapter?
2. Make out a schedule by months for the school year showing conscious activities through which an industrial-arts teacher may grow in his profession.
3. Do you believe that it is necessary for a teacher to be acquainted with the subject matter of a number of other fields except his own?
4. Do you believe in the opinion of some that knowing the subject is sufficient guarantee of good teaching? Explain.
5. Make a list of points that might be noted in an observation trip in a junior-high-school woodworking shop or drafting room.

6. In your experience to what extent do you feel that directed teaching in a teacher-training institution has been helpful for later teaching?
7. What means have been applied by boards of education for encouraging teachers to do further study?
8. List ten professional books, with their authors and publishers, which you would wish an industrial-arts teacher to possess and read.
9. Make a list of trade journals that have value for industrial-arts teachers.
10. Name the national associations the activities of which should be of interest to shop teachers.
11. Name four popular magazines which often contain suggestions for shop projects and problems.
12. What teachers' organizations exist in your state for promoting vocational and industrial-arts education?
13. What flaws do you find in the argument that teaching on the job is the only worth-while way of learning to teach?
14. In your experience do you feel that you have absorbed teaching methods unconsciously from your own teachers in high school and college?
15. To what degree do you believe that a broad collegiate background makes an industrial-arts teacher more effective?

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Chapter XVIII

SOURCES AND PREPARATION OF INDUSTRIAL-ARTS TEACHERS

Sources of Industrial-Arts Teachers

From the very beginning of organized mechanical activities in schools, the question of the sources of teachers and their background has been an important one. Opinion has been divided as to the relative importance of practical experience, pedagogical training, and liberal-arts education, in the making of an efficient instructor in the school shop. And where it has been granted that an instructor of this special type of work should possess all of these phases of preparation as a background, the question of which is of most importance has still remained a debated one.

Teachers of shopwork in public schools have generally come from one of two main sources: (1) teacher-training institutions, and (2) the crafts and industries.

Each of these types of teacher possesses, generally speaking, certain definite characteristics. Each type has brought into the work valuable contributions toward the development of the total program of industrial education as we know it today. Each, on the other hand, has lacked certain desirable abilities and characteristics possessed, perhaps, by the other.

The School-trained Product

By a product of a teacher-training institution is meant the teacher who has received his preparation for teaching through a definitely organized school procedure. The high school and the normal school or other teacher-training institution have contributed to his preparation. Many administrators favor

this type. The baccalaureate degree, and the diploma indicating definite professional attainments, have come to be looked upon as standard guarantees for admission into the teaching profession. And while it may be said that many teachers of this type have added other types of experience and training to that received in schools, it is also true that there is still a large number whose principal preparation, both technical and pedagogical, has been obtained in schools.

Within this group belong two kinds of teachers: (1) those who have prepared themselves principally to teach some academic subjects, and who later or simultaneously have acquired a minimum amount of technical training, sufficient for taking charge of a class or two in shopwork, and (2) those who have pursued definite courses for preparing themselves to teach only in this special field.

Strong Characteristics of the College Product

The strong qualities of a shop teacher who is a product of a teacher-training institution may be enumerated as follows:

1. *General academic and scholastic background.* To know some language, history, literature, and other liberal-arts subjects, in common with other teachers of the school, is a valuable asset, even though the major portion of the work done is to be in the school shop.

2. *Professional preparation, including pedagogy and psychology.* There are general, tested principles upon which all teaching is based, a knowledge of which adds to the value of the work of a teacher. These principles have been studied extensively by this type of teacher.

3. *Appreciation of general objectives in education.* With such appreciation a person will know better what part his work will and must play, and will accord to other subjects their rightful place in the total educational program.

4. *Coöperation with fellow teachers.* A broad vision of

what education attempts to accomplish will make the teacher tolerant and coöperative toward the work and problems of other members of the teaching force.

5. *Knowledge of school-shop organization.* This type of teacher has attended school recently and learned his work under school conditions. Understanding of the organization of the school shop is a natural result, aided by his professional training in the special field.

6. *Knowledge of customary school discipline.* He will know through his own experience, and through practice teaching, what is considered proper conduct in the shop.

7. *Knowledge of methods of teaching.* In so far as his skill in mechanical work extends, this type of teacher has been trained in methods of procedure in demonstrating and explaining his work.

8. *Appreciation of problems of administration.* Through his professional preparation, he appreciates the larger aspects of the work of administration, and is able to adjust himself to better advantage.

9. *Usefulness in related and extracurricular activities.* A broader knowledge of the entire program enables the teacher to serve in connection with extra assignments, such as home rooms, study halls, student enrollment and other activities.

10. *Takes advantage of written and printed material.* His experience in handling available reference and text material, job sheets, and other printed aids cause him to make use of such material in his teaching.

Weaknesses of the School-Trained Teacher

The strong points mentioned, valuable as they are to any instructor, do not cover all the desirable qualifications for an efficient shop teacher. As disadvantages often characteristic of this type of teacher, the following may be mentioned:

1. *Lack of mechanical skill.* With the best training and

practice that an institution can give, it is difficult to find sufficient time for repetition of mechanical procedure until reliable habits have been developed. Some acquire more skill than others in the limited time available. Lack of skill is a serious drawback in teaching mechanical work.

2. *Lack of appreciation of standards of workmanship.* Too often work is allowed in schools that would not be acceptable in industry, and if a teacher's training is too limited he may not know the difference.

3. *Lack of proper methods in production.* Whether or not this type of instructor fails at this point depends somewhat upon the quality of instruction which he has received. But, generally speaking, there is likely to be difficulty in this connection.

4. *Lack of appreciation of value of materials.* If in his training he has been allowed, as often is the case, to spoil one piece and receive another without special comment or consequence, the teacher may make himself subject to this criticism.

5. *Lack of appreciation of time values.* Industry stresses the value of time. In schools, even in teacher-training institutions, the time element is not greatly considered. A great deal of time is wasted in some school shops.

6. *Lack of ability and interest to coöperate with industry.* There is danger that the school-trained man will busy himself in his work at his school, and fail to make contacts with industry. His previous experience has not led him out in that direction.

7. *Lack of coöperation with labor.* Much valuable assistance and support are lost by teachers who fail to make contacts with individual craftsmen and labor organizations. If the instructor cannot "talk the language" of the trade, he is not likely to solicit such contacts for their full value.

By listing these possible weaknesses it is not meant to indi-

cate that all teachers who fall under the type discussed here suffer from all the disadvantages mentioned. These are listed as general tendencies. Many instructors whose preparation is almost solely that of the teacher-training institution have been remarkably free from nearly all these disadvantages; but this fact does not eliminate the value of the suggestion that teachers so trained can profitably examine themselves in the light of these comments.

Craftsmanship as Background for Teaching

From the rank of tradesmen have come a large number of men into the work of shop teaching. Some of these have been subjected to a definite training program before entering the school shop as instructors; others have come almost or totally without such training. Skilled craftsmanship as a foundation for this type of instruction has been held by many to be the most important prerequisite. Some administrators have gone so far as to say that skill of hand plus common sense make a sufficient foundation for success in the school shop, while the more recent practice seems to be a rather uniform demand for a certain specified amount of definite teacher training before certification to teach is granted.

Strong Qualities of the Craftsman

In common with the type of teacher already discussed, the skilled tradesman brings with him into the school shop many valuable assets, among which are:

1. *Mechanical aptitude and skill.* As has been suggested previously, skill in doing is a prime requisite in teaching others how to do manipulative work. This skill is first of all possessed by the person who has become an outstanding craftsman.

2. *Knowledge of standards of workmanship.* The skilled mechanic has a keen eye for qualities of workmanship, and is inclined to demand that high standards be maintained.

3. *Appreciation of time values.* Experience in industry, where a man must produce so much or give his job to another, makes a person sensitive to the value of time. Loafing and wasting of time by students are intolerable to the person who is familiar with the demands of the trade.

4. *Knowledge of standard trade methods.* The basic methods and procedure of the trade are usually applicable to the school. Tradesmen know these methods and will have them used in the shop.

5. *Ability to create and maintain shop atmosphere.* The proper atmosphere in the school shop is extremely important. No other person can bring it about so naturally as the person who has lived in it for years. Even a most casual visit will tell the experienced observer whether such atmosphere of labor and industry prevails.

6. *Ability to coöperate with industry.* The tradesman "knows the language" of industry. He can coördinate the work of the shop as need be with industry and with employers. He can get the confidence of those who furnish employment and who may lend support to his work.

7. *Ability to make contacts with labor.* Having come from the ranks of labor, this type of teacher can obtain the full confidence of labor. Such confidence is of value in developing a shopwork program in the school. Wherever the program has a vocational emphasis, this is doubly important, since the graduates sent into industry will of necessity mingle with those already in the trades.

Weaknesses of the Craftsman Teacher

As in the cases of the other type, not all the desirable characteristics of an efficient teacher are found in the craftsman. He is usually subject at least to the following difficulties:

1. *Lack of knowledge of pedagogy and teaching methods.* There is a long step between being able to perform skillfully

and being able to tell and demonstrate to others how to perform. To some men this step is more difficult than to others. To all who are habitual producers, it involves something entirely new. Without proper methods of instruction no successful work can be done.

2. *Lack of appreciation of the beginner's difficulties.* After manipulative work has become habitual, as in the case of the journeyman worker, it is not a natural trait to analyze the work from the standpoint of learning difficulties. Unless the craftsman is caused in some way to reorganize his thinking, he will err in this respect very seriously.

3. *Lack of basis for proper discipline.* The few regulations or rules for conduct that might have been compulsory in the shop will not apply to young boys in school. Men from the ranks of industry are at a loss in regard to suitable regulations for boys in the school shop, and are likely to be unnecessarily strict, or to place no restrictions at all upon their students, in many instances.

4. *Overemphasis upon production.* It is difficult for this type of teacher to realize that efficient instruction in the school shop is not always measurable by the weekly output of finished products. Acquisition of skill and knowledge by the students must come first. In this there must be an output, but its volume does not measure the amount of instruction given or the value received.

5. *Lack of appreciation of other subjects.* The attitude that considers shopwork the all-important phase of the school program is a result of ignorance of other studies and their content. Full coöperation with other departments will best serve everyone in the long run. Increased knowledge of the entire curriculum will make the special teacher more valuable in teaching his own subject.

6. *Lack of appreciation of value of written and published material.* The craftsman is not accustomed to taking informa-

tion out of books. He may be slow in seeing their value for his students.

7. *Lack of coöperation with administration.* Lack of knowledge of school organization and problems in school administration is often a cause of failure to coöperate.

8. *Lack of general usefulness.* The teacher who is considered to be of most value is the one who can serve the school outside of his classroom as well as within. Unless the instructor has a broad knowledge of the general problems of the school, and the principles underlying its organization, he will be handicapped in this respect.

New Recruits for the Profession

In recruiting prospective teachers for industrial arts, both the sources discussed in this chapter should be kept in mind. Young men from the skilled crafts who have the proper background and personal qualities should be encouraged to enter teaching as a profession. But they should be advised at the same time to take a sufficient period of professional training to become properly adjusted to their new profession. This can not be done satisfactorily in summer session work, but should include regular residence work, with cadet teaching. Men with industrial background are needed for advanced work on the technical level in high schools. A person who goes into teaching as a lifework rather than as a means for semiretirement will wish to take a sufficient amount of professional preparation to equal others in the same field.

The chief source for recruiting suitable teachers will probably continue to be high-school graduating classes, and here is where teachers in the service and counselors of high-school students need to do a more thorough job. The teaching profession is now sufficiently attractive to interest the most able of high-school graduates. But, as is often the case, teachers think of other professions as more desirable than their own

and fail to realize the need for recruiting strong candidates for the many opportunities in this field of work.

PROBLEMS AND QUESTIONS

1. What, in your opinion, can the school-trained shop teacher do to remedy the deficiencies listed in the first part of the chapter?
2. What type of teacher was considered most efficient in the Swedish Sloyd system as advocated by Salamon?
3. From what sources were teachers obtained for the early American, manual-training schools?
4. Make out what you consider the most desirable program of experience and training for a shop teacher for junior high schools.
5. Repeat Number 4 for teachers of nonvocational subjects in the senior high schools.
6. Name some teacher or supervisor of your acquaintance, and show how his training has or has not contributed to his efficiency.
7. Make a list of strong and weak points in the types of teachers discussed, in addition to the factors mentioned.
8. Make a study of six nationally known teachers or administrators in the field of industrial arts, and learn what has been their background.
9. Make a study of the credential requirements in your state for teaching industrial-arts subjects in the junior high school. In the senior high school.
10. Make a similar study of the requirements for teaching vocational, all-day, trade-preparatory classes under the Federal Vocational Education Act, as administered by the state authorities.
11. What can a college-trained, industrial-arts teacher do to learn about industrial methods and industrial production?
12. Is it possible in your opinion to have too much trade experience as a background for teaching industrial arts or vocational classes?

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Chapter XIX

SCOPE OF SERVICE AND FUTURE OPPORTUNITIES

Teaching as an Occupation

The time is past when teaching as an occupation was open to any person with some college training who found himself prepared to do nothing else, or who failed to get a position in the work for which he was specially trained. Now specialized preparation is expected and demanded for this service as distinctly as for any other professional work.

And it is well that it should be so, for with these new demands has come also a new and different evaluation of the teacher and his work. The public, on the one hand, is realizing that the efficient teacher is worthy of rewards other than the personal satisfaction of having rendered sacrificial service. The teacher, on the other hand, is coming into the work with a background of special training, and with the intention of making teaching his lifework. With this intention in mind, he proceeds to improve himself further in the service, and to elevate the profession in which he is now a definite member. He quits apologizing for being a teacher, and takes pride in belonging to this professional group.

While teaching cannot now, and probably never will be, considered a money-making occupation, it is, nevertheless, true that the financial remuneration is more nearly commensurate than ever before with the time used in preparation for the work and the service rendered. It is probably as good on the average as in similar occupations demanding an equivalent expenditure of time and money in preparation, with a better opportunity at the outset than in many of them.

In Comparison with Industry

In industry and business the aggressive person gets promoted, and his salary is increased. In teaching, the same is true. In teaching shopwork and special subjects, particularly, there are many opportunities for the live teacher to do more than the minimum essentials for holding the job. Hard work brings recognition here as elsewhere. When we are outside looking in upon business and industry, we see the name of the occasional person who receives the big promotion, but we hear nothing of the unknown, routine worker, who has labored faithfully and long to the exacting hours prescribed by the firm, and who is yet a long way from the office manager's or the general manager's position.

Why Teach?

But the financial remuneration alone is not the determining factor. A true teacher finds in the work many other rewards, among which are the following:

1. *A chance to use initiative.* Teaching usually involves freedom to use one's own ideas; to organize the work and the means for carrying it out; to use one's own methods in obtaining results; and to use one's personality in putting over the job.

2. *Making human contacts.* One who is a natural teacher cannot fail to derive satisfaction from dealing with humanity in its plastic state, and from being instrumental in shaping the ideas and ideals of youth. In this opportunity lies a large portion of the teacher's reward.

3. *Variety in work.* Teaching can never become a monotonous, routine job to one whose heart is in the work. There is an endless variety of approaches and responses which will keep the teacher alive. In the shop and laboratory this variety is further multiplied, and the teacher's day can never seem too long.

4. *Opportunity for outside contacts.* The traditional idea that the teacher is a shut-in, and has no chance for social or other contacts outside of school, is probably no more true than the teacher makes it true. There are ample outside associations that may be formed, and that should be formed, and the teacher can find time and opportunity to make such contacts.

5. *Continuous employment.* Very few occupations are so little dependent upon business, economic, political, and other conditions for continuous employment as is that of a teacher. Quality of service is the criterion upon which the teacher's tenure of office usually depends, and it is right that it should be so.

Outlook for the Future

Persons who contemplate entering the field of teaching in industrial education, and those who are preparing themselves for work in this field, have a right to be concerned over the question of the scope and limitations of their future opportunities for service. Limited listing of the types of opportunities which may come to those who have prepared themselves to teach shopwork of various kinds may be of help in regard to this question.

As a Teacher of Shopwork

Within the field of shopwork teaching a broad variety of situations may be found. The extent to which a teacher can fit into any or all of these will depend upon his training and experience as well as upon his temperament and personal choice. Requests for service of teachers over a period of years have indicated the following types of demands, and types of shop organizations:

1. *Unit shops in junior high schools.* Such shops have increased in number very rapidly in city school systems. The

person who expects to be successful in this type of shop must have a thorough knowledge of and skill in the specific subject involved; and must, in addition, have an interest in the problems of early adolescence and a sympathy for the student of that age.

2. *General shop in junior high schools.* The organization of this type of shop has been discussed in Chapter XIV. For success here are required the same personal characteristics as those mentioned for the unit shop. The difference lies in the fact that a broader scope of mechanical work is covered, and consequently the teacher must possess a variety of skills instead of being a craftsman in one type.

3. *Industrial arts in elementary schools.* Opportunities are numerous for service in the smaller grammar schools where the junior-high-school organization has not been introduced. In many cases such appointments involve the serving of several schools in carrying out the weekly program, and sometimes the teaching of other subjects in addition to shopwork becomes a part of the task.

4. *The smaller high schools and union high schools.* In these schools it is often necessary to teach two or more distinct types of shopwork. Requests for service coming from these schools indicate that almost any combination of shop activities may present itself. The general shop in all its variations is found in these types of high schools.

5. *Nonvocational work in city high schools.* In this connection the unit shop is the most common, but in many city high schools, particularly where the ninth grade is included, the general shop is in use. For teaching unit courses in any high school the teacher must possess a definite degree of skill in the subject which he attempts to teach, in addition to having the required knowledge of the objectives, principles, and methods pertaining to his special type of work, and to the program of the school in general. The shopwork in this con-

nection may be general in nature, or more strictly technical as a preparation for engineering courses.

6. *Vocational work in the high school.* Mastery of the trade, both from the standpoint of methods and skill in doing, is the first prerequisite for teaching vocational classes. Methods of teaching, knowledge of objectives, and understanding of youth are of almost equal importance.

7. *Special schools and classes.* To teachers interested in students of the special type who have not and will not profit by the regular school program there are special opportunities for service. The public-school systems often segregate such students for special attention, and the instructor of construction work becomes popular and valuable if he will learn to understand the problems involved and prepare himself for solving them.

8. *The "industrial" schools.* Persons with mechanical skill and human sympathies, in addition to a knowledge of the human mind, are needed in the special schools for boys who have been placed in state or other institutions for correction. To restore such individuals to society is a service worthy of the attempts of the most skillful of teachers.

9. *Part-time classes.* The part-time education program which has become a definite part of all larger school systems offers opportunities for teachers of shopwork in all principal types of shop activity.

10. *Adult classes.* Through night-school programs, teachers of shopwork often have opportunity to extend their services and earn additional salary. This field is rich in possibilities for the industrial arts.

Supervision and Administration

While supervision is not a natural and logical ultimate attainment for all ambitious shop teachers, it should be pointed out that the supervisors usually come, and should come, from

those who have teaching experience within the field to be supervised.

The fact might be stressed, however, that there must of necessity be many teachers for each supervisor. It may also be of value to point out that many persons who are doing outstanding work as instructors do not become equally successful as supervisors. To be a teacher of boys and girls is a noble occupation for which some men are eminently fitted, and in which they are happily engaged. The supervisor's job is not easier; it is simply different. For a limited number of outstanding teachers who are able to deal with men as well as they have dealt with boys, it is a worth-while plan to obtain the necessary additional preparation for service as a supervisor.

Two Levels of Supervision

In general, two separate types of supervision are recognized by boards of education, and by systems of awarding credentials:

1. *Departmental supervision.* As the term implies, this type of supervision deals with a department in a school. It may involve all the shopwork offered in that school, or may be confined to a group of subjects, such as metalworking department, woodworking department, and so on. For this type of service there is a general demand.

2. *General supervision of a field of work.* Under this classification comes city-wide supervision of industrial-arts work, or of vocational education, or, as is often the case, of the entire program of industrial education, including both vocational and nonvocational instruction.

The Coördinator

The coördinator, whose office has come to be a definite part of industrial-education programs, is usually drawn from the ranks of teachers. In a sense he is a supervisor and an in-

structor in one person. In addition to knowledge of the trade or occupation supervised, special interests and qualifications are necessary for this type of activity.

Occupational Counseling and Guidance

While occupational study and guidance do not fall exclusively within the realm of industries, it may be mentioned that experience in industry and business forms a splendid background for rendering service in this field. Thus it happens that teachers of shop subjects often become interested in a certain group of students for whom the school of the past has done very little, and through this interest they are welcomed as counselors for larger groups. The practical outlook upon life possessed by the teacher of technical and manipulative subjects is the outlook needed by a large majority of high-school students.

General School Administration

Positions of counselor, vice-principal, principal, and superintendent are logical goals of industrial-arts teachers who wish to go into administrative work. As a matter of fact, teachers whose background has brought them in contact with industry and technology have an advantage in dealing with many aspects of school administration, including contacts with a large portion of parents. The profound effect of invention and industry upon the pattern of modern living necessitates an understanding and appreciation on the part of persons in administrative positions affecting the educational and social development of youth. The teacher educated in industrial arts should be in a peculiar position to grow into such responsibilities.

PROBLEMS AND QUESTIONS

1. From where should our future teachers of industrial arts be recruited and what qualifications should they have?

2. Make a comparison between the training requirements for teaching academic subjects in high schools fifteen years ago and those of today.

3. Make a survey of the average salaries paid inexperienced high-school teachers and of those paid engineering graduates in their first positions.

4. Who in your opinion is responsible for recruiting suitable teachers for the profession, and by what procedure should they be recruited?

5. In what ways do you consider industrial-arts teaching to be different today from what it was twenty years ago?

6. What are the principal discouraging factors in being a shop teacher at this time?

7. Is teaching used more or less as a steppingstone to other occupations now than formerly? Give reasons for your conclusions.

8. Make a list of reasons why persons quit teaching and go into other work.

9. Ascertain what training is required before a person can become a city supervisor of industrial-arts education in your state.

10. Answer the assignment in the foregoing paragraph with reference to supervision of a program of vocational trade training in high schools.

11. Make a list of names of persons of your acquaintance who have dropped out of the teaching profession and have gone into other occupations.

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